AMERICAN
JOURNAL OF SURGERY

VOL. XXVII. JUNE, 1913. No. 6

THE ANTITOXIN TREATMENT OF TETANUS.

ELLIS E. W. GIVEN, M. D.,
Visiting Surgeon to the Dispensary, Episcopal Hospital, Philadelphia, Pa.

The treatment of tetanus by means of its specific antitoxin is sharply divided into two distinct phases, one dealing with the prevention of the disease, the other with the treatment after symptoms have developed.

Shortly after the discovery of the antitoxin for this disease it was believed that all that was necessary to cure the disease after symptoms had developed was to inject sufficient antitoxin to neutralize the amount of toxin then present in the body, but that this was erroneous was proven by the high death rate following such serum treatment.

Tetanus toxin combines with nerve tissue and when so combined antitoxin is powerless to break up the union; but it is capable of neutralizing all toxin in the body not so combined if injected in sufficient dose and brought in direct contact with it.

If a quantity of tetanus toxin known to be fatal to animals is mixed with sufficient antitoxin, the mixture thus made can be injected into the animal without fear of tetanus resulting, the antitoxin having combined with the toxin forming a non-toxic mixture.

Toxin and antitoxin when injected simultaneously but at different points are absorbed with different degrees of rapidity. The toxin is absorbed more rapidly than the antitoxin and tetanus will develop to a mild but curable degree.

According to Vaillard* injections of serum made during the incubation of the disease will give results varying according to the dose given and the tissue into which the injection is made. If the injections are made into the cellular tissue the preservation of the animal is almost certain, while if the virus is injected into the muscle without being neutralized with the antitoxin, the antitoxin being given elsewhere into the body, it is doubtful if the animal can be saved.

When an individual receives a wound contaminated with street dirt, garden earth, stable manure, or other tetanus-bacilli-bearing matter, living bacilli are thus injected directly into the body and if there is broken down tissue, blood clot or a suppurating wound, they begin to grow, and, after a time varying from a few days up to eight, ten or more days, symptoms of tetanus develop, the toxin liberated from the growing bacilli having combined with the nerve tissue.

Antitoxin injected about the same time that the wound occurred would be in the body ready to neutralize the toxin as liberated from the growing bacilli before it combined with the nerve tissue, for after the combination with nervous tissue antitoxin cannot break up the combination thus formed.

Dehne and Hamburger* have carried out experiments to determine the duration of immunity in man, and report that the blood in the injected man rapidly increases in protective power up to the second or third day after injection, to remain constant to about the seventh or eighth day, after which time a rapid fall in protective power is noted and only slight trace can be found up to the twentieth day.

In animals, especially the horse, injected for prophylactic purposes, the immunity to tetanus lasts much longer than it does in man, and this lengthened time of immunity is explained by the fact that the horse serum, which is the usual medium for conveying the antitoxin to man, is, when injected into the human being, a foreign protein and as such is rapidly expelled, but when injected into the horse it is a normal constituent of that animal's body and is retained for a much longer period of time, conferring immunity for the full period.

According to Nocard and Leclainche† the prevention of tetanus following traumatism is assured by injection of tetanus antitoxin; their belief being founded on results following the prophylactic injection of over 3,000 animals.

In the early days of the manufacture of antitoxin there was no fixed standard by which to judge of the potency of the product used and results differed widely according to the serum used. Prior to 1908 this condition held throughout the world, but from this date (1908) manufacturers began to standardize their products. France at present gives a pro-

* Vaillard—Bull. de l'Acad. de Med., May 26, 1908, pp. 567-577; June 2, 1908, pp. 584-597.

* Dehne and Hamburger—Wien. klin. Woch., Jahr. XX. No. 27, July 4, 1907, pp. 817-823.

† Nocard and Leclainche—Les Maladies micro-bienne des animaux, 2 vols., 3rd ed. Paris, Masson, 1903.

tective dose of about 500 units; Germany 2,000 units, while the standard prophylactic dose in the United States is 1,500 units.

Antitoxin, being able to combine only with the toxin that is free in the blood and lymph channels, is able to act only so long as the toxin is thus contained; it is therefore necessary to begin prophylactic treatment as soon as possible after the receipt of a traumatism suspected or known to carry tetanus injection.

As soon as possible after such a wound is received it should have a full, free and open cleaning, a general anesthetic being administered whenever the condition of the wound or patient renders local anesthesia undesirable.

Incisions should be such that will best expose the wounded areas, both superficial and deep, all foreign material, blood clots, torn and lacerated or severely bruised tissues must be removed and the wound made to be as clean and free as possible of everything which would cause or tend to cause subsequent breaking down of the surrounding tissues, or suppuration within the wound. Manipulations must be made gently and with light touch, no caustics or irritating chemical solutions or acids are to be used. After all parts of the wound, including obscure pockets, etc., have been thoroughly but gently treated, at least 1,500 units of a recent and standard tetanus antitoxin must be injected into the patient. This may be injected into any part of the body but is preferably into or near the original wound so that the nerves, injured by the accident and near to the site where the probably introduced tetanus bacilli will grow and give off their toxin for absorption, will most readily take up the newly formed toxin. The wound is to be left "open," lightly packed with 10% iodoform gauze or plain gauze followed by sterile gauze dressing and bandage. Redressing should take place at least once every twenty-four hours, when all parts of the wound are to be exposed to the air and again dressed as on the first day.

If the wound is a severe one with prolonged suppuration favoring the retention and growth of living tetanus bacilli, or there is discharge of broken-down tissue from the wound, then in addition to the daily dressing subsequent injections of tetanus antitoxin should be given every seventh or eighth day, dating from the day of first injection of antitoxin, as long as suppuration persists, for, as has been cited*, the blood contents of antitoxin become almost absent after the end of the first week and toxin liberated from the retained tetanus bacilli present in the prolonged suppurating wound would, after the end of the first week, find no antitoxin present to combine with and neutralize it. In this way is explained those cases of late development of tetanus in patients with prolonged suppurating wounds who, shortly after the receipt of the injury, had received one prophylactic dose of antitoxin but none subsequent.

Should the wound be such that bony tissue is attached and necrosis occurs, this must be removed fully and freely for tetanus is likely to develop in a wound once infected with tetanus bacilli if suppuration continues.

The healing of the wound and the prevention of tetanus depends, as Vaillard* says, upon three agents:

1. Antitoxin, to neutralize the toxin present.
2. Phagocytosis, to deal with the bacilli in absence of the toxin.
3. The surgeon, who shall with care remove all blood clots, foreign material, bruised or broken down tissue, and leave the wound in a condition for healing.

When treating this severe and dangerous disease no effort should be spared to obtain and use only the most reliable material and preparations; dried serum containing the antitoxin is not recommended. If this is dusted into the wound absorption may take place, but dependence cannot be placed on it. The only time dry serum is permissible is when it is the only serum obtainable, it may be used but never is it to supersede the standard liquid serum of known antitoxin content.

For a number of years I have made it a practice to administer a prophylactic dose of tetanus antitoxin to all patients having wounds contaminated with street dirt, garden earth, etc., entering my service at the Episcopal Hospital, or seen in private practice, and none of these patients thus injected, so far as I know, has developed tetanus. Recently a collection and study have been made of all tetanus admitted to the Episcopal Hospital from 1905 to 1912, and none of these cases had had a prophylactic dose of tetanus antitoxin.

The treatment of the disease after symptoms have set in has to deal with a condition where there is an enormous amount of highly potent toxin circulating freely in the body and great quantities are rapidly being formed and absorbed, while an unknown amount has already been absorbed into the nervous tissue.

Treatment should be begun at the earliest possible moment by eliminating from the body as much

* Dehne and Hamburger—loc. cit.

* Vaillard—loc. cit.

of the toxin as possible by free venesection and lumbar puncture and the injection of huge doses of antitoxin by subcutaneous, intravenous and intraspinal methods to neutralize the unabsorbed toxin circulating in the body, together with intraneural injections to reach and neutralize the toxin contained within the nerves. No limit should be placed on the amount of antitoxin to be injected, if obtainable, for it will surely neutralize all the unabsorbed toxin, and if this is neutralized and the bacilli have been removed by the surgeon so that no more toxin is formed to be thrown into the system for absorption, the body may be able to successfully combat the amount already combined with nervous tissue. If antitoxin is withheld there is nothing to neutralize the great quantity of uncombined toxin which then will soon combine with nervous tissue and add its toxic power to the unknown amount already combined.

The local treatment of the wound, if it can be found, must follow much the same lines as noted for the prophylactic treatment. A general anesthetic often indicated to control the spasms must be given in order to thoroughly clean out the wound. If it has closed it must be freely opened, importance being placed on local cleansing of the wound, for the tetanus bacilli are always a local infection, rarely being found away from the original site of injury. All blood clots, broken down or suppurating material must be carefully removed with light and dexterous manipulations, great care being exercised to produce no bruising of the tissues which might give resting place for growth of any bacilli unintentionally left in the wound.

After thorough cleaning the wound is to be lightly packed with iodoform gauze or plain gauze, as noted under prophylaxis, which dressing is to be repeated at least once every twenty-four hours.

Supporting systemic treatment is indicated, together with highly nourishing food in liquid form given, if necessary, through a stomach tube, and sedative drugs are to be administered as indicated, the patient being treated in a quiet and darkened room.

BIBLIOGRAPHY.

Behring and Kitisato: Deutsch. Med. Woch., Vol. 16, 1890, pp. 1113-1114.

Reck: Zeit für Veterinär, Jahrg. 13, Heft, 5 May, 1901, p. 214.

Hutyra and Marck: Spezielle Pathologie and Therapie der Haustiere, 2 vol. Zweite auflage, June, 1909.

Richmann: Berlin. Tier Woch. Vol. XXV., No. 44, Nov. 4, 1909, pp. 801-802.

Nocard and Leclainche: Les Maladies Microbienne des Animaux. 2 vol., 3rd ed. Paris, 1903.

Vaillard: Sur les injections preventive de serum antitoxique dans le prophylaxic du tetanus de l'homme. Bull. de l'Acad. de Med., May 26, 1908, pp. 567-577; June 2, 1908, pp. 584-597.

Labat: Sur l'emploi du serum antitetanique Rev. Vet. Vol. XXVII. (LIX.), Sept. 1, 1902, pp. 580-586.

Naudrin: Am. de Med. Vet. Tome 52, No. 8, Aug., 1903, pp. 442-446.

Huguier: Rec. de Med. Vet. Tome LXXXVI., No. 11, June 15, 1909, 357-360.

Dieudonné: Rec. de Med. Vet., Tome LXXXVI., No. 13, July 15, 1909, pp. 433-437.

Labat: Rev. Vet., Tome XXXIV. (LXVI.), No. 9, Sept. 1, 1909, pp. 537-542.

Pecus: Jour. de Med. Vet. et de Zoötech, Tome 60, Oct. 31, 1909, pp. 591-593.

Rapport de Commission: Rec. de Med. Vet., Tome LXXXVII., No. 6, March 30, 1910, pp. 125-141.

Hitchens: American Vet. Review, Aug. 1910.

Pearson: American Vet. Review, Vol. 21, No. 6, Sept., 1897, pp. 380-386.

MacFarland and Ranck: Jour. of Comp. Med. and Vet. Arch. Vol. 20, Nos. 10 and 11, pp. 639-646.

Nocard: American Vet. Review, Oct. 1897, pp. 453-462.

Dehne and Hamburger: Wien. klin. Woch. Jahr. XX., No. 27, July 4, 1907, pp. 817-823.

Römer und Sames: Zeit fur Immun. Orig. Bd. IV., No. 3. Dec. 28, 1909, pp. 270-285.

Rosenau and Anderson: Bull. No. 43, Hyg. Lab., U. S. Pub. Health and Marine Hospital Service, Washington, D. C., pp. 1-55, March, 1908.

CHRONOLOGY FOR HARE-LIP AND CLEFT-PALATE OPERATIONS.

First.—In complete cleft of the palate with single hare-lip, close the bones within the first three months, preferably within the first month.

Second.—Close the lip from four to eight weeks later.

Third.—Close the soft palate at fourteen to sixteen months old. This applies in case of cleft-palate unaccompanied by hare-lip.

Fourth.—Use no material for sutures that can absorb and retain secretions. Use only silver wire, lead plates and horse-hair, and the results of the operation will usually be successful.—T. W. BROPHY, in *The Lancet-Clinic*.

OPERATIVE TECHNIC IN INTUSSUSCEPTION.*

S. C. BEEDE, M. D.,
Daird City, Neb.

The choice of a method of operating for invagination of the bowel can be made by the consideration of factors that are fairly constant. Practically all cases are in a condition of depression that precludes prolonged operation. More than three-fourths of all cases are in patients of tender years that in any condition bear surgical shock but poorly. One quality then of the chosen method must be its brevity, and whatever choice is made this element must be one of the most important considerations. For similar reasons the plan chosen must contemplate the least possible handling of the viscera; for if visceral manipulation in ordinary conditions adds to the shock, and predisposes to post-operative intestinal paresis, how much more will these obtain in the tissues of impaired vitality with which we are dealing?

In common with all forms of mechanical obstruction of the bowels invagination, to be treated successfully, must be operated upon early. A recent compiler of statistics estimates that three-fourths of all cases operated upon in the first twelve hours recover, while only one-fourth of those operated upon in a later period are saved. No dilatory tactics can be tolerated. In this connection I wish to submit that the rectal injection of oil, water, or air, under anesthesia or without an anesthetic, in the horizontal position, the inverted position, or any other position is a dilatory measure, as well as an unsafe one; that its use by the general practitioner is a potent excuse for delay in referring the case to the surgeon and should be discouraged. The universal treatment is by operation, and that operation abdominal section, if we may exclude those rare cases that may be successfully resected by way of the rectum.

The recurrence of intussusception shortly after its reduction has been sufficiently frequent to make it necessary that the operation performed include such a fixation of the bowel or shortening of its mesentery as will prevent recurrence at this site. Whatever may finally be demonstrated to be the actual cause of death in obstruction of the bowels, experience has shown that drainage of the stagnant fluid in the gut above the point of obstruction promotes the recovery of the patient. Advanced cases of intussusception form no exception to this rule and in them provision for such drainage must be made. Threading the gut on a glass tube introduced into it through an incision into its lumen is unclean, time-consuming, and involves more visceral manipulation than is admissible in our ideal operation. The method of stitching into the gut a large rubber catheter with rows of purse-string sutures after the manner of a Senn gastrostomy, as repeatedly described by a former president of this association, is decidedly superior and its principle should be included.

Important as this drainage may be, it is of still greater moment that gangrenous tissue should be removed from the field of absorption. When it is present, resection of the bowel must be done; and as it frequently exists in the irreducible invagination, whether or not it shows upon inspection, it follows that irreducible intussusceptions must always be excised and the expedient of anastomosing the gut above with that below the obstruction or of simple enterostomy must never be adopted.

I believe that the technic presently to be described best meets the indications outlined and is an adaptation of well known methods with some variations that have seemed of sufficient value in my own work to warrant their presentation. It does not apply to the occasional adult case that results from intestinal tumors and diverticula, where unusual conditions must be met by measures adapted to that particular case.

The anesthetic must be the one that produces the least depression. Spinal anesthesia has been used in the most remarkable operative cures reported in the literature, but has not found favor with American surgeons, besides having inherent objections to its use in the young children who form such a large proportion of our cases. Gas with oxygen is the ideal anesthetic, and when its use becomes more general may be the one chosen. Ether for the present must be our reliance in the average case. Chloroform is especially objectionable in these depressed subjects. The surroundings should be the most favorable for rapid and efficient work, the hospital being chosen if it is accessible. Initial stomach lavage should be routine practice. Some cases apparently moribund become fair surgical risks when this is done. Iodine sterilization of the operative field is particularly appropriate here and will not prove unduly irritating if the official tincture is diluted with an equal amount of alcohol, even if the subject is a young baby.

The incision should be of sufficient length to give free access at once to the invaginated bowel. Its location is determined by the tumor if one is palpable. If no tumor be found, and usually in any

* Read before the Western Surgical Association, December 21, 1912.

event, it should be made through the right rectus muscle downward from a point opposite the umbilicus. About four-fifths of all bowel invaginations begin in the ileo-cecal region, to which this incision gives the readiest access. The tumor should be delivered through the incision and isolated with hot moist pads. The intussusception should be reduced by stripping the bowel off the tumor from below. The gut is grasped at the apex of the intussusception with the thumb and finger of one hand and the tumor at its middle with the other and the hands passed toward each other, thus pushing the penetrating mass backward through the intussuscipiens. The gain made is held by the first hand and the maneuver repeated till reduction is completed or further progress is impossible. Then, and not till then, gentle traction upon the entering gut may be made if no necrotic tissue has been discovered. It is admissible at this stage to introduce a blunt dissector between the entering and returning layers of the bowel to break up soft adhesions, but cutting the folded edge of the bowel is not justifiable for the reason that if the edema is here so great as to prevent reduction the vitality of the part still invaginated will be found so questionable as to demand excision.

The invagination being reduced, and the variety being the usual ileo-cecal, whose apex is the cecum and not the ileo-cecal valve as commonly stated, the meso-appendix is now ligated and severed and the viscera are returned to the abdominal cavity. A blunt forceps is forced into the abdomen through a stab just within the iliac spine, the appendix caught at its tip and pulled through till the cecum is flush with abdominal wall and held there by a stitch through it and the skin. If there is much visceral distension the tip of the appendix is snipped off and a soft rubber catheter passed through its lumen into the small intestine, the finger guiding it through the ileo-cecal valve. The abdominal incision is closed with retaining sutures of silkworm gut and layer sutures of catgut. The appendicostomy affords a ready means of draining the bowel and introducing fluid for absorption. Should the distension prevent a ready return of the viscera into the abdominal cavity, it can be rendered easier by introducing the catheter first and partially emptying the coils through it. Should drainage of the bowel not seem necessary at the time, it can still be utilized in the hours succeeding the operation should it become desirable. In any event, it fixes the cecum firmly so that that variety of intussusception cannot occur again and disposes of the appendix which, at least sometimes, excites it. In a few days it can be snipped off flush with the skin and soon disappears in the scar.

Should the invagination prove to be irreducible, it should be excised from within the enveloping gut. First, as much reduction as possible is made. If a gangrenous area is uncovered, it should be reinvaginated. A sero-muscular suture unites the bowel below to that above at the point of entrance of the intussusceptum. This is of linen and begins opposite the mesentery. When that structure is reached the needle is passed through the mesentery of the entering layer at its junction with the bowel and back again through all three layers, then forward again at the point of first penetration and on to the place of beginning where it is tied. A longitudinal incision is now made opposite the mesentery an inch or more below the line of suture and the intussusceptum delivered through it, the intestine above having been clamped after its contents had been stripped back to prevent leakage. A protected clamp is now placed on the base of the tumor at the suture line and the mass cut away about a quarter of an inch from the clamp. If the intussusceptum is long, it may be clamped and cut away before delivery. The clamp now embraces the entering and returning layers of the gut with their mesenteric attachments lying between them. A through and through continuous suture is applied to unite them and prevent hemorrhage from the cut mesentery and the clamp is removed. A large soft rubber catheter is passed into the gut above the suture line through the longitudinal incision, which is closed with Lembert sutures, beginning at the lower end. When the catheter is reached at the upper end of the seam, it is continued around it two or three times as a purse-string suture, invaginating the bowel wall about the tube as it is tightened and tied. The abdominal wound is closed with retaining sutures of silkworm gut and layer sutures of catgut. The first peritoneal stitch catches the bowel immediately above the catheter and maintains it in apposition with the abdominal wall. One silkworm gut suture is tied about the catheter to prevent it from slipping out. In cases not demanding bowel drainage this feature may be omitted. If the condition is desperate and the few moments required to make the initial peritoneal suture are an additional peril, it may also be omitted; but the additional safety it affords justifies its routine use. However, the second through and through suture alone is very secure, both as against leakage and against hemorrhage. It should never be displaced by the glover stitch in this situation. This method is applicable to the majority of cases requiring re-

section, and meets the indications outlined. Recurrence in the same place is impossible when resection is made. It is secure against leakage and hemorrhage. It can be done more rapidly than any other resection. It saves all the healthy bowel possible and preserves some that by any other method must be sacrificed. The only tissue exposed to soiling is below the obstruction and hence the most resistant. It exposes to traumatism the least possible amount of viscera. It provides for drainage in the distended bowel. An extensive study of the literature shows that its essential features have given the best results.

But some cases will require resection by some other method, as, for instance, one in which the vitality of the intestine has proven to be deficient after reduction has been accomplished. The choice then is a closure of the divided ends of the entrail and a lateral anastomosis of the two limbs. This can be done more expeditiously than an end-to-end union in these cases, as the tubes to be united are of different caliber either because the anastomosis is between ileum and colon, or between the thinned out part above the obstruction, and the contracted part below. It is more secure, as it avoids the danger of a leak in the suture line at the mesenteric border. The technic is so familiar that it is rehearsed only to emphasize some time-saving features.

The portion to be excised having been determined, two clamps are placed on each end of it, about one-fourth inch apart. One pair of clamps is now taken in the left hand, while a peritoneal stitch of linen encircles the healthy bowel about three-quarters of an inch from the line of section, beginning and ending at a point opposite the mesentery. The bowel contents are now stripped back a few inches and held away from the operative field by a guarded clamp on the intestine at this point. The gut is now severed with a knife, shaving close to the clamp on the part to be removed and the ends dried with gauze. A catgut ligature is thrown about the end to be closed beneath the clamp and tightened and tied as the latter is loosened and removed, the ligature thus falling into the groove made by it. The ligated stump is inverted into the bowel beyond the encircling suture which is tightened as a purse-string and tied, the ends being left long to serve as tractors later. The other line of section is treated in the same manner. By making traction upon the long ends of the purse-string sutures and holding firmly the two clamps that were placed upon the bowel to prevent leakage, the two limbs which are to inosculate lie side by side like two ribbons with the anti-mesenteric borders in the most favorable position for the anastomosis, which is now made in the usual way without the use of further mechanical aids. The exsected part of the bowel still has its ends closed by the forceps and they are not removed, but are used to put the mesentery upon the stretch. This structure is now under easy control and can be clamped and tied off with great facility and its edges sutured together. Should a bowel drain be necessary the clamp is removed from the upper limb and a catheter inserted before the ligature is tied and an additional purse-string suture applied. The drain tube itself then furnishes the most convenient instrument for inverting the stump. This limb is then sutured to the peritoneum and the wound is closed in the manner already described.

DISEASES OF JOINTS AND BONE MARROW.

LEONARD W. ELY, M. D.,
DENVER.

CHRONIC ARTHRITIS.

The subject of chronic arthritis presents many unsolved problems, and to the superficial observer appears a most discouraging one, but, to him who will trace carefully the progress of investigation for the past fifty years, the prospect is bright with promise. One by one various diseases which may cause the joint lesions have been identified and carefully described, and, while much remains to learn, probably no obstacles exist that will not yield to patient work. It is not a field for dazzling exploits. He who wishes to achieve brilliant results without hard work should turn his attention to some other branch of medicine. Possibly it is this absence of the theatrical which causes the discoveries that have been made to attract so little notice.

DEFINITION. Chronic arthritis is the expression in the joint tissues of a long continued irritation. The irritation may be mechanical or chemical. In the last analysis both are very similar.

CLASSIFICATION.

Most if not all cases of chronic joint diseases are divisible into two main classes, the first characterized by a proliferation of the synovia and of the lymphoid marrow with a *resulting* atrophy of the cartilage and bone, and the second by an exactly opposite condition, namely an inflammation and degeneration of the synovia and of the marrow, with a *resulting* hypertrophy of the cartilage and bone. If we regard these changes in the bone and cartilage as primary we are quite unable to comprehend or to classify them, but if we study the

tissue from which the cartilage and bone draw their nutrition we seem to make a long stride toward a solution.

TYPE I.

Cases Characterized by Proliferation of the Synovia and Marrow, Followed by Atrophy of Bone and Cartilage.

Under this heading fall tuberculosis, chronic gonorrheal and syphilitic arthritis, and that large group of cases described by English writers generally as Rheumatoid Arthritis; by Goldthwait and others as Atrophic Arthritis, by Nichols and Richardson as the Proliferative form, by Nathan and

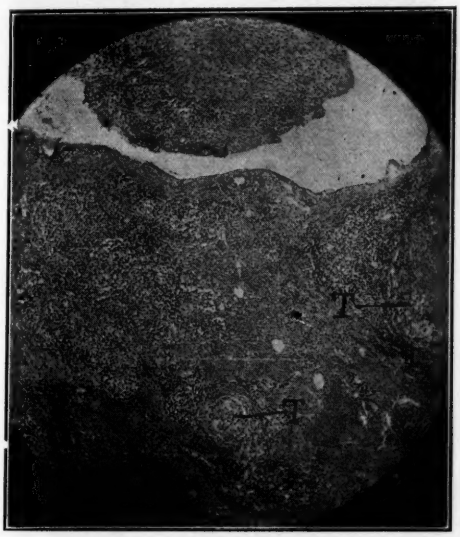

Fig. 16.
Photomicrograph synovial tuberculosis of the adult knee—slow, chronic form, with well-marked production of fibrous tissue. The disease had existed, with desultory treatment, for many years, and was completely cured by the author's resection three years ago. The patient now is in health. T—tubercles, well encapsulated by new fibrous tissue. The structure above is an hypertrophied synovial villus. Zeiss apochromatic 16 mm. Objective.

others as Metabolic Osteo-Arthritis, and by other writers by various other appellations. It includes also some of the cases recently described under the heading "Infectious Arthritis." As the view is gaining ground that all these joint diseases are probably of infectious origin, it seems to me unwise to separate a special class under that name, implying that others are of different origin (1).

JOINT TUBERCULOSIS.

Etiology. The exciting cause is the tubercle bacillus. Heredity, environment, trauma and the acute infectious diseases have all been considered as contributing causes. The influence of trauma has probably been overrated, and, as we shall see in our study of the pathology, those cases which start in the bone marrow cannot be influenced in the beginning by trauma, for the marrow is shielded from any force other than fracture. Trauma may, however, bear a more direct causal relation to the cases starting in the synovia.

In a large proportion of instances one of the acute infectious diseases precedes the onset of joint tuberculosis, especially among children. Measles ranks first, then whooping cough, then scarlet fever and pneumonia.

PATHOLOGY.*

Upon a proper understanding of the pathology

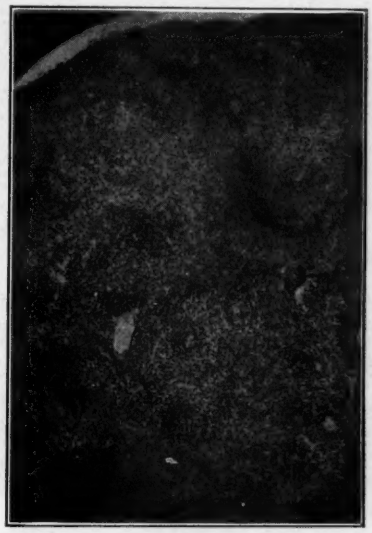

Fig. 17.
Photomicrograph of synovial tuberculosis of the adult knee—rapid, destructive, diffuse form with almost no evidences of fibrous encapsulation. The patient died shortly afterwards of pulmonary tuberculosis. At A may be seen a typical giant cell, and just above it a large area of beginning necrosis. The entire synovial membrane was enormously thickened. Zeiss apochromatic 16 mm. Objective.

of joint tuberculosis depend our ideas of the entire subject, and he who would treat the disease intelligently must master this aspect of it: Otherwise his treatment will resolve itself into a jumble of expedients that constantly must be changed to accommodate themselves to every new and extraordinary therapeutic measure. Let us start at the beginning and trace the entire process.

It is obvious, in the first place, that too much reliance must not be placed upon experimental joint tuberculosis. Numerous investigators have injected the joint cavities of animals with a pure culture of tubercle bacilli, and by observing the resulting joint changes have tried to build up the pathology of the disease, but in so doing they have reversed the actual pathological changes, for in the disease as it occurs in nature the joint cavity is affected from

[1] "Certain writers would make another type which they would term 'ineffective.' In the present condition of our knowledge it seems better to restrict this term to conditions associated with a definite organism."—McCrae.

* Received for publication, March 4, 1913.

the joint tissues, not the joint tissues from the joint cavity. Other investigators have injected pure cultures into the nutrient arteries of the long bones, and, while their findings are of somewhat more value, still they are apt to lead us astray, for it is doubtful if a plug or embolus such as this might occasion, is often responsible for the beginning of the disease. Here, as elsewhere in the body, the disease probably starts by the deposition of one bacillus or of several bacilli either in the embrace of a white corpuscle, or floating free in the blood stream.

Fig. 18.

Photomicrograph of section of wall of old encapsulated tubercle in bone. At the left are fairly normal bone and marrow, then comes an almost complete wall of bone, then a layer of fibrous tissue. At one spot C can be seen a piece of cartilage, probably representing a stage of bone formation. Leitz objective No. 2.

Immediately the question arises, "Why are these tubercle bacilli deposited in the neighborhood of the joints and rarely if ever in the shafts of the long bones?" This question has for years proved a stumbling block. Upon its answer much depends. Some say that the increased circulation necessary for the rapid growth in the region of the epiphyses is the explanation, but rapid growth and increased circulation are not causes of tuberculosis, and we do not find the disease ordinarily in other rapidly growing tissues. Again, the disease occurs frequently in adults, whose growth has ceased.

Liability to injury has been advanced as the answer, but injury is also no cause of tuberculosis. A frequently injured muscle or ligament is never the starting point of the disease, and the joints most often injured, such as the hand and foot, are not most often involved. No injury but a fracture can affect the bone marrow in any way.

The lack of anastomosis in the terminal blood vessels in the neighborhood of the epiphyseal line in children has been held responsible, and is still regarded so by many observers, yet joint tuberculosis occurs in adults, as we have said, in the ends of whose long bones the customary anastomosis exists. Again, this lack of anastomosis does not exist in the bones of the spine, and in the short bones of the carpus and tarsus, even in children, but tuberculosis is fairly frequent in these localities. In adults the synovia is frequently involved primarily, and here again we can find no lack of anastomosis. On the other hand, when we look further

Fig. 19.

Photomicrograph of an intense tuberculosis of the marrow, near the cavity of a bone abscess. Above may be seen a milder inflammation of the marrow. A.A.A. bone trabeculae, the lower ones necrotic; G. Giant Cell. Zeiss apochromatic objective 16 mm., ocular 4.

and consider the various other organs of the body, the brain, for instance, we do not find that the presence of end arteries predisposes them to tuberculous involvement. If we accepted this view of the cause we should immediately be in difficulty to explain why the tubercle bacillus was arrested by the end arteries, and involved the joint end of the bone, while the staphylococcus lodging at or near the same spot, involved the shafts, and produced the ordinary acute suppurative osteomyelitis. The same may be said of the claim that the "spongy nature of the bone," or the sluggish circulation in its capillaries permitted the deposition of the bacilli. The simple, easy explanation lying directly before our faces, has passed unnoticed. Tuberculosis manifests throughout the body a marked affinity for epithelial, endothelial and lymphoid tissues, and, *if unmixed with a secondary infection,* it rarely attacks directly any other tissue[1] whatever, but sim-

ply affects them by interfering with their nutrition.

In the region of the joints we find two lymphoid structures, the red marrow and the synovia. We find red or cellular or lymphoid marrow also in the short and flat bones, the vertebrae, sternum, cranial diploë, carpus, tarsus, etc., and we note that wherever this lymphoid marrow is found, the bone in that region is vulnerable to tuberculosis, and where it is not found, there the bone is invulnerable, or practically so, to a pure tuberculous invasion. The unmixed disease never occurs in the shafts of the long bones, where ordinary yellow or fatty marrow is found. Occasionally it is found in the shafts of the long bones of young children, but at this period of life, lymphoid marrow is still present in the

Fig. 20.

Same case as the preceding. Photomicrograph of a section of the bone at some distance from the abscess. This shows well the futility of any operation designed to remove the focus of disease. There is no known way of distinguishing the presence of this tubercle. Above can be seen a tubercle almost surrounded by bone trabeculae, then comes a strip of non-tuberculous marrow (M.M.) containing a thickened artery (A.) and engorged veins (V.V.). The dark bone trabeculae below show a well-marked productive osteitis. Zeiss apochromatic, 16 mm. Ocular 4.

shafts. As age advances, less and less red marrow is present in the ends of the long bones, and bone tuberculosis becomes less frequent.

Numerous authorities have found that after a complete bony ankylosis in a joint, the bone in that locality takes on the characteristics of the bone in the shafts[1], and the lymphoid marrow in the adult changes to the fatty variety. This explains the cure of the disease after successful resections, for the most enthusiastic advocates of radical removal of diseased tissue could not maintain that they had eradicated it all, at least they could not maintain this if they studied their tuberculous joints under the microscope.

Joint tuberculosis is very rare in children under one year of age, because their bone ends are mostly cartilaginous. When the disease occurs at this period of life it is probably synovial.

The presence of lymphoid tissue is, then, the prime cause for the location of the disease in the neighborhood of the joints, and the process may start in the synovia or in the lymphoid marrow. In children the original focus is said to be almost invariably in the marrow, in adults, though good authorities differ on this point, the synovial form is probably of about equal frequency with the myeloid. At no time in the course of the disease, provided

Fig. 21.

Photomicrograph of knee joint tuberculosis in an adult, Leitz objective No. 2. Joint surface above, bone marrow below. Osteoid tissue at the bottom of the articular cartilage. Note how the granulations are "eating into" the cartilage from below, and how the superficial portion of the cartilage is undergoing fibrillation.

secondary infections do not take place, is any other joint tissue directly involved, except the inner cellular layer of the periosteum[1]. The ligament, the fibrous layer of the periosteum, the cartilage and the bone trabecula are all absolutely immune to an unmixed tuberculous infection, and merely suffer in their nutrition. The disease must find its pabulum in the two "lymphoid" tissues, and if we can cause the disappearance of these two tissues the disease cannot exist.

Too much stress cannot be laid upon this point. All our therapeutic ideas must be based upon it, and it will be found that all therapeutic measures which have survived the test of time are in con-

[1] This rule may possibly have a very few exceptions, but if exceptions exist, they are so rare as to be practically negligible.

[1] Vide the chapter on ankylosis.

[2] Adami and others maintain that the disease may start in the periosteum, and this may be so in rare instances.

sonance with this idea: *No function, no red marrow and synovia; no red marrow and synovia, no joint tuberculosis.*

The tubercle bacilli, deposited in the synovia or in the lymphoid marrow, give rise to the initial tubercle, with its lymphoid, epitheloid and giant cells, and this tubercle, following the usual course, tends to spread at the periphery and to undergo necrosis at its centre, and to involve more vulnerable tissue in the neighborhood.

From the start of the process the forces of repair are also at work, and according as one or the other predominates, the disease tends to extension or to recovery. Sometimes the disease is progressing to destruction in one part of a joint and to repair in another. Sometimes the reparative processes are seen to be strong, sometimes feeble.

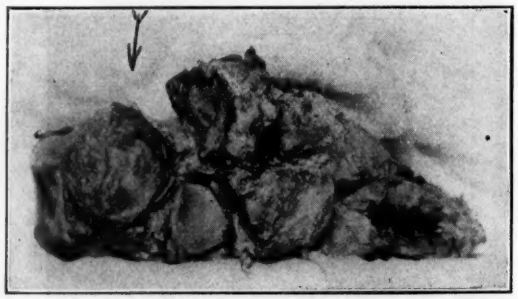

Fig. 22.
Tuberculosis of the talo-navicular joint in an adult. Note the erosion of the joint cartilage.

Here as elsewhere in the body nature strives to cure by encapsulation, and walling off, and often a microscopical examination of the stained slide will give a good idea of the clinical history of the case. If the course be slow and chronic, much fibrous tissue will be found; if rapid and acute, very little.

Tuberculous disease in the marrow may exist for a long time without involving the synovia, and *vice versa*. It cannot jump across the joint from one bone to another except by way of the synovia. An intact articular cartilage forms an absolute barrier to its progress.

Let us trace more minutely the process of the infection, observing its effect upon the various tissues, and taking up first the cases beginning in a so-called bony focus, or, better expressed, in a marrow focus.

The tuberculous inflammation in the lymphoid marrow—say in the upper end of the tibia—causes an irritation in its neighborhood, that may result in a temporary productive osteitis of the trabeculae, but, as the disease spreads, this soon changes to a rarefying osteitis, and to a destruction of the bone tissue. If the spread be rapid, a large piece of the bone will be killed at once, and a sequestrum may result, but the usual course is a slow spread and a destruction of the bone in small pieces, giving us the so-called "bone sand" so characteristic of the disease.

The tuberculous granulations may extend downward to the limits of the lymphoid marrow. Here they stop. Outward the granulations may make their way to the periosteum. Here also they stop, unless an abscess be formed and the contents force

Fig. 23.
Low power photo-micrograph of a case of knee joint tuberculosis in a child about ten years old. The focus was located on the shaft side of the epiphyseal line. The tuberculous granulations made their way to the periosteum, and burrowed along under this, and then under the articular cartilage. A—articular cartilage, B-epiphysis, C—epiphyseal cartilage, D—periosteum, E—tuberculous granulations.

their way through the periosteum into the tissues outside. The cartilage draws its nourishment from the subjacent bone marrow. When the tuberculous granulations reach the under surface of the cartilage they interfere with its nutrition, and it begins to degenerate. The first sign of this degeneration is often a fibrillation. Sometimes the tuberculous granulations can be seen under the microscope pushing their way through the cartilage. They may break through at some one spot, or they may spread out and break into the joint at the margin of the cartilage. Sometimes they spread out under the entire cartilage and lift it off. When they gain the joint, they infect the synovia on its surface, or, if the disease has reached the margin of the cartilage without breaking into the joint, then the synovia is probably involved by direct extension. The disease then attacks the other bone or bones of the articulation, entering them at or near the periphery of the joint cartilage.

Before the tuberculous granulations reach the

joint a serous effusion is often formed in its cavity.

The synovia shows the typical tubercles when it has been involved, on its surface or in its substance or both. It is thickened, succulent, and usually presents greatly enlarged villi: again, it may be tough and fibrous. It may be involved throughout its extent or only in certain areas. It sometimes hypertrophies, and extends outward over the joint surfaces, hiding them more or less completely—synovial pannus. This pannus may be attached to the degenerated cartilages or it may not be. It does

Fig. 24.

Low power photo-micrograph of a portion of a collection of rice bodies in their capsule, from a tuberculosis knee joint in an adult.

not "eat its way" into the cartilages, as some writers have affirmed, but the disease spreads from the synovia under the cartilages at their margin and causes them to degenerate by shutting off their nutrition.

At any stage in the proceedings detailed above, serum and white blood corpuscles may be added to the necrotic bone tissue, cartilage and diseased marrow, and a tuberculous abscess may be formed in the bone, which later breaks into the joint: or the abscess may be formed in the joint itself. In rare instances the abscess breaks through the periosteum and never involves the joint at all.

If formed in the joint, or if it has reached the joint after formation in the head of the bone, the abscess may rupture through the ligaments and so, reaching the extra-articular structures, may make its way to the surface, or it may stay indefinitely in the extra-articular structures, or, never emerging from the joint, it may finally disappear entirely.

Careful examination will often reveal in these abscesses a few tubercle bacilli, but not invariably.

The walls of a tuberculous abscess are formed by the necrotic tissues in which they lie. These walls *are probably themselves never tuberculous, unless the abscess be secondarily infected.* If secondarily infected, then tubercles will be found in the walls.

If the abscess be opened or if it rupture spontaneously, then it will almost invariably become secondarily infected, and will remain open for a long time, communicating with the joint and with the surface by tracts called *sinuses,* whose walls, as well as the tissues of the joints to which they run,

Fig. 25.

Tuberculosis of an adult's wrist. Note the swelling. This picture would do equally well to illustrate any joint disease in Type I. There is nothing characteristic about it. No one could possibly make a diagnosis from its inspection.

are lined with tubercles, and discharge large quantities of foul pus.

SYNOVIAL DISEASE.

When the disease starts in the synovia the original tubercle is deposited in its lymphoid tissue, and the disease extends down to the fibrous capsule and through part of the membrane, or throughout it all, possibly involving the bone by extension into its substance at the margin of the cartilage, where the synovia is attached. From this point there is no essential difference in the behavior of the two forms, bony and synovial.

On the other hand the disease may remain for years confined to the synovia and may never extend to the bone, unless this extension be brought about by unwise operative measures.

The surface of the synovia may be covered by necrotic tissue in places, and necrosis may also be detected in its substance. Layers of fibrin have been described by many writers as occuring on the surface. I have not been able to identify them.

In one case, a careful staining showed what we had taken to be fibrin was pseudo-fibrin.

Let us then hold in our minds the picture of a disease making its way through the lymphoid marrow and synovia, and changing their structure. The diseased areas always have a tendency to break down. The bony cartilaginous and fibrous tissues are degenerating, breaking down, and crumbling away because their nutrition is cut off. Nature on her part is striving to stop the process by walling it in with fibrous tissues, and in the bone by building up thickened trabeculae in addition. All her efforts tend to destroy joint function.

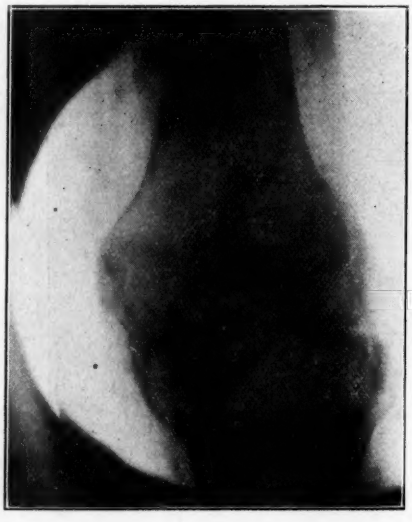

Fig. 26.

Knee joint tuberculosis in the adult, of about ten years' duration —the slow chronic form. Note the disappearance of the joint cartilage, the worm-eaten appearance of the bone, and the areas of bone condensation. An arthroplastic operation was done on this joint, but of course the wound broke down, suppuration ensued, and a subsequent resection was necessary.

Tuberculous joint disease, if no serious damage has been done to the articular cartilage, may turn back to practically complete recovery. The usual result is a more or less damaged joint with a restriction or abolition of motion. The ankylosis is always fibrous. *Bony union never takes* place except after resection, or in children after a mixed infection.[1]

RICE BODIES.

Rice bodies are small, hard, white, smooth, slippery bodies. Sometimes found in tuberculous joints, especially in the synovial forms of the disease characterized by a slow extension and more or less effective efforts at repair. The nature of their origin has been a disputed point, but, inasmuch as in one joint in our possession a collection of them was found, enclosed in a well-defined fibrous capsule in the diseased synovia, we may infer that they are the result of a process of repair, possibly of the walling off and condensation of tuberculous granulations. They must be set free in the joint—they are usually found free—by the bursting of their capsule.

The tissues in the neighborhood of a tuberculous joint take part in the disease to a limited extent. The tendon sheaths and bursae—synovial structures—are prone to direct involvement. The other tissues suffer from interference with their nutrition. Atrophy is a marked feature of tuberculous joint disease, and in this atrophy all the tissues of the limb take part—muscles, bones, etc. The atrophy above and below the joint accentuates the appearance of the joint swelling, and causes the bone ends to look enlarged, but this enlargement is only apparent. No exostoses ever form in tuberculous joints.

Fig. 27.

Tuberculosis of several years' duration in the elbow of an adult treated by conservative measures. Note the disappearance of the cartilage, and the atrophy of the bone. This picture illustrates well the futility of conservative treatment in the adult.

MICROSCOPIC APPEARANCE.

There are some diseased joints that may be diagnosed as tuberculous with the naked eye, but there are many others that cannot. The synovia may be studded with tubercles, but again it may simply be hypertrophied and inflammed. Areas of necrosis may or may not be found in it. The joint may be the seat of a serous, or of a turbid, flocculent exudate, or of a tuberculous abscess, or it may be a mass of fibrous adhesions.

The cartilages may be perfectly smooth, they may prevent one or more dimples, they may be eroded at their margins or on their surface, or they

[1] See section on ankylosis.

may be dead and may be found loose in the joint.

The bone tissue may or may not be necrotic. It may be hard and dense in spots, and soft and carious in others. Abscess cavities may be found in its substance. Sometimes sections of it will float in water. Often it undergoes a fatty change—the so-called fatty osteomalacia.

Attempts have been made to classify these tuberculous joints according to their gross appearances. Thus "Joint Fungus" was the name given to those cases in which an extreme proliferation existed in the synovia, while "Caries Sicca" was the type of disease characterized by a dry condition of the joint, and a preponderance of osteal involvement.

Fig. 28.
Tuberculosis of the phalanx in a child—spina ventosa.

Such divisions are purely artificial and apparently quite unnecessary, as well as very confusing.

PATHOGENESIS OF BONE TUBERCULOSIS.

We have seen that the disease occurs in those portions of the bone only where lymphoid marrow is found, and that it disappears when the lymphoid marrow disappears. Now, according to the accepted relation of the lymphoid cell to the tubercle bacillus, this is exactly contrary to what we should expect, for why should the tubercle bacilli thrive in a tissue rich in cells (lymphocytes) whose function is to destroy them, and then disappear when these cells disappear? In the end we shall probably be compelled to revise our ideas on what Ziegler calls the "poetic" theory of phagocytosis[1]. We know that the red blood cell is the food of the malarial plasmodium, recent investigations point to the fact that the lymphocyte is the chosen domicile of the treponema pallidum[2], and it is more than likely that we shall conclude that the lymphocyte, instead of being the active foe of the tubercle bacillus, is, in fact, its food. Admitting this, then all we need do to cure joint tuberculosis is to cause the disappearance of the lymphoid cell from the bone marrow and from the synovia.

SYMPTOMATOLOGY AND COURSE.

The onset of the disease is almost invariably slow. Often the exact date of the beginning of the symptoms is impossible to set. They are usually so mild at first that the patient disregards them, or ascribes them to a "touch of rheumatism."

The symptoms and physical signs common to

Fig. 29.
Tuberculosis of the left side of the sacrum in an adult. Note the irregular bone atrophy. The right sacro-iliac synchondrosis is "sprung," and the chief complaint of the patient was a right sciatica.

other diseases of Type I are found here—pain, stiffness, swelling, limitation of motion, change in attitude, deformity, disturbance of function, and often a local increase in temperature.

In addition, in the cases with bone involvement two physical signs are more or less characteristic, namely, muscular spasm and early muscular atrophy. In point of fact, almost all the symptoms are worse in the bony cases.

The pain varies greatly in its severity. It may be very intense or comparatively insignificant, local or referred, constant or intermittent. It is almost invariably aggravated by motion. It is often worse at night, and wakes the patient up when the muscles holding the joint quiet relax—"starting pain." The patient may wake up with a cry—"night cry"—and immediately fall asleep again.

The referred pain must always be remembered,

[1] See also Petrie, Journal of Pathology and Bacteriology, 1903, IX, 130.
[2] Vide J. E. R. McDonagh. *The Lancet* (London), Oct. 12, 1912.

and must not lead us astray in our diagnosis. In spinal disease the pain may be felt in the back, the chest, the arms, the abdomen, the hip or in the lower extremities. In disease of the hip, pain in the knee is a frequent symptom.

Local sensitiveness to pressure can be elicited if the joint is superficial. In the early stages the pain is wont to be most severe when the patient begins to move about in the morning, and wears away during the day. The same may be said of the stiffness. It is due to the muscular spasm and to the inflammatory products.

Swelling of the joint is a constant phenomenon, but in the deeper joints, such as those of the hip and spine, it cannot be detected unless of extreme degree. The swelling may be boggy, in the fungous type of synovia, or it may fluctuate. With the formation of an abscess the swelling may reach an extreme degree. In the knee, elbow and ankle especially it often takes on a peculiar fusiform shape, accentuated by the atrophy of the muscles above and below the joint: The overlying skin becomes blanched, and the superficial veins distended. This peculiar condition has received the name "White Swelling" or "Tumor Albus."

Limitation of motion is caused by the muscular spasm, and by the inflammatory products in the joint. That caused by the former disappears under an anesthetic, that by the latter does not.

Muscular spasm is essentially a conservative symptom, and represents nature's means of putting the joint at rest. If the needed rest be furnished by apparatus, the spasm abates. It is on guard during waking hours, but, as the patient falls asleep, relaxes and permits motion—hence the pain. It is partly responsible for the change in attitude of the joint. If this faulty attitude persist, the muscles become set in their contracted state and cause "contractures"—fixed faulty attitudes. The hip is flexed, adducted and rotated in, the knee flexed and the tibia subluxated backward and rotated out, the elbow semiflexed, the ankle plantar-flexed, etc.

The change in attitude (deformity) and the functional disability are the result of the muscular spasm and of the inflammatory process in and about the joint. The attitude is due to the influence of certain muscles as Jansen has pointed out[1]. At first it is determined by the contraction of the "uniarticular" muscles, i. e., those passing over the affected joint alone. The later contractures are due to the contraction of the "multiarticular" muscles, i. e. those passing over more than one joint.

In a general way, semiflexion is the characteristic attitude of joint tuberculosis.

[1]Jansen, Archiv. für Klinische Chirurgie, November, 1911.

In untreated cases the defomity may be extreme, and may completely cripple the patient.

The disability is due to the inflammatory products, the pain, the muscular spasm, and the altered attitude. The patient spares the affected joint when he can. This results in a limp in the lower extremity, and in a vicarious use of the unaffected upper extremity.

The local temperature varies somewhat as the severity of the disease. Usually it is not perceptibly raised in the ordinary cases, but it may be quite high in the face of a secondary infection.

Early atrophy of the muscles moving the joint is fairly characteristic of joint tuberculosis—but not

Fig. 30.
Tuberculosis of the calcaneus.

of the pure synovial disease. It is partly the atrophy of disuse, but an added element in its causation exists that has never been explained. The constant contraction of the muscle interferes with its nutrition (?). All the tissues of the limb, as time goes on, come to participate in the atrophy, so that, under certain forms of treatment, the limb is greatly withered. Any of the above symptoms or all may be present during the course of the disease. Usually the march is fairly steady, and, untreated, goes on to partial destruction of the joint. Abscesses appear, approach the surface, burst and become secondarily infected. The constitution becomes involved and the patient dies of septic intoxication, exhaustion, tuberculosis of some other organ, or amyloid degeneration. On the other hand spontaneous cure may result.

The purely synovial cases are distinctly milder in their course. They can exist for years without seriously damaging the joint. Tuberculosis is not to

be ruled out because, after the disease has lasted for several years, the patient is in health, and his joint is simply moderately swollen, sensitive, and limited in its motion. It is not unusual for the surgeon to hear from an adult patient a year or two after examination that he is "practically" well without treatment.

The Röentgen picture of a tuberculous joint is what one would expect from a study of the pathology, and presents the features common to all cases in Type I, namely, a thickening, erosion, or disappearance of the articular cartilage, and a thinning and porosity of the bone. The bone often presents a worm-eaten appearance. In the later stages of the slow cases a thickening and condensation of the bone is apparent in areas. The shafts of the long bones also show an atrophy. In the short bones the bone trabeculae lose their distinctness. In children the epiphysis may have "furred" edges. A properly developed plate may show a thickening of the joint capsule.

The disease in the spine presents certain peculiarities. The laminae and other processes, composed as they are of dense bone, as a rule escape its ravages, but the spongy bodies are eaten away, thus depriving the column above of its base of support. As the bodies crumble the weight is assumed by the articular processes located behind them, and the column above bends slowly forward, swinging on the articular processes as on a hinge, and giving to the spine at the affected region an angular convexity backward—kyphosis—one of the principal signs of Pott's disease. The angularity of the kyphosis distinguishes it from that formed as the result of most other diseases. It is wont to be prominent when it occurs in the thoracic region, and is an earlier sign in children than in adults. Above and below the kyphosis the normal spinal curves change.

Spasm of the back muscles is an early sign of Pott's disease, and causes the patient to assume a stiff, rigid attitude. The attitude varies according to the location of the disease. A familiarity with the normal attitude and with the normal spinal curves enables one to recognize any departure from them.

Pressure upon the roots of the spinal nerves causes the referred pains heretofore mentioned. It causes also various other disturbances, such as grunting, respiration, cough, etc.

The inflammatory products about the cord sometimes exert pressure upon it, and interfere with its functions. Incontinence or retention of urine and feces may result. In certain cases a spastic paralysis develops in the lower extremities—Pott's paraplegia. This is seen most often in disease of the upper thoracic region, and in adults may be the cause of the patient's first visit to the surgeon.

If the morbid process involve the lateral spinal articulations, a lateral curvature ensues.

The disease may follow the usual course, or it may exist for many years with progress so slow that a diagnosis is not made.

SPINA VENTOSA.

The finger and toe joints are occasionally affected in adults. In children the shaft of the bone is vulnerable to the tuberculous affection. The disease eats away the interior of the bone, and at the same time a new proliferation of bone takes place at the periphery, giving to the shaft the swollen, puffed-up appearance which is responsible for the common name of the disease. Strangely enough the joints in this form of disease show little tendency to involvement, and the diagnosis from syphilitic dactylitis may be impossible to make. Secondary infection is very frequent.

Tuberculosis affecting the calcaneus is met, with a fair degree of frequency, especially in children, and presents one or two peculiarities. Its favorite site is the anterior portion of the bone, and it seldom if ever involves a joint. Its course is rather tedious.

Abscess formation is so frequent an accompaniment of joint tuberculosis that it should be classed rather as a frequent symptom than as a complication. Its frequency is variously estimated. Some abscesses are so small as to escape detection. The abscess may be formed in the bone or in the joint cavity, and differs from the ordinary acute abscess in that it contains no pus germs. It is an accumulation of serum, a few blood cells, and broken down material, and does not affect the constitution nor produce any symptoms except mechanically by pressure. It may persist indefinitely, it may be absorbed, it may travel by gravity and the line of least resistance for some distance in the fascial planes, or it may become at any time infected by pus germs. In the last case its contents change in their nature, true pus forms, and the symptoms and signs become those of the ordinary abscess.

If the cold abscess rupture spontaneously, or if it be opened with a knife, its walls immediately fall together, and can be seen to be lined by shreds of necrotic material. Practically no swelling is present in the surrounding tissues, the opening into the cavity called a "sinus", lies flat, and discharges a small amount of a serous fluid. In a day or two, if no precautions against infection be taken, sooner or later in almost every case, the surrounding tissues become inflamed and swollen, the opening becomes puffy and infiltrated, and the discharge becomes

profuse, purulent and often very foul. The cavity of the abscess now is lined by a porky granulation tissue, which on section is found to be filled with tubercles, and these porky granulations can be found lining the walls of every tract leading to the original focus in the joint.

A marked constitutional reaction accompanies this process. The temperature shoots up, and the patient becomes acutely sick. The constitutional symptoms persist for a while, and then slowly subside, but the sinuses and abscess cavity, once secondarily infected, may remain open for years, and in the end may be indirectly the cause of death.

Fever is not a symptom of tuberculosis joint disease. If the patient be kept out of doors and in good condition his temperature may remain consistently normal. High temperature means the involvement of some other organ, or the occurrence of a secondary infection.

COMPLICATIONS.

Tuberculosis disease of the lungs is a frequent complication in adults, meningitis in children. The last is invariably fatal. Tuberculosis adenitis is fairly frequent, tuberculosis of other organs also. Amyloid degeneration is a natural consequence of prolonged suppuration, and unless amputation remove the limb in the very earliest stage of the affection, it is also invariably fatal.

PROGNOSIS.

The prognosis as to life is good in children and in adults under proper treatment. Simple joint tuberculosis involves in itself absolutely no danger to life, except the cases located in the cervical spine, on account of the proximity of vital structures; but we fear the complications. A tuberculosis in a patient must bring these before our minds. A secondary infection immediately makes the prognosis much worse.

The various joints carry a different prognosis; the smaller the joint, as a rule, the better the outlook. Tuberculosis of the spine in adults has always been practically hopeless, but the recent advances in treatment threaten to change this. Tuberculosis of the sacro-iliac articulation is usually fatal. A prompt reaction of an adult's joint often improves his general health. Many robust men are walking about, whose tuberculosis knees have been resected. Much depends on the treatment, and upon the willingness of the patient to carry it out.

The functional result varies somewhat as the age. In children the result under the best treatment varies from complete bony ankylosis to good function. I have heard surgeons of experience say they would be satisfied with a perfectly stiff joint in a good attitude, and without shortening. Others claim excellent function in most of their cases. Personally I am inclined to side with the former.

As to adults: Some years ago, as the result of clinical and pathological studies, I made the statement that painless motion in the adult tuberculous joint was an iridescent dream. Others had reached this conclusion before me. I have never yet seen anything to make me change the opinion, that a tuberculous joint cured by conservative means with good motion, in an adult, was simply a case of erroneous diagnosis. Patients disappear and send word back to the surgeon with some exhibition of glee, that his prognosis was erroneous, but in the end they must submit to the loss of their joint. I have yet to see a proved case of joint tuberculosis in an adult that recovered with motion, and this in spite of the fact that all my training has been on conservative lines.

Children may recover with good function, with fibrous ankylosis, or, if a secondary infection has taken place, with bony union. In adults the result is always a fibrous ankylosis, and the old tubercles, more or less encapsulated, may be set free by trauma at any time.

DIAGNOSIS.

From other cases in Type I tuberculosis often can be distinguished by its slow, more or less steady course, its almost invariable uniarticular nature, by the frequent accompaniment of other tuberculous lesions in the body, by the general absence of acute exacerbation unless an abscess form, or a trauma be received. The tuberculin test is suggestive but not final. If a piece of the synovia were examined under the microscope it *might* be conclusive, but only if tubercles were found in it, and it must be remembered that tuberculosis might exist in the membrane and not in the specimen examined. It is rarely justifiable to open the joint for diagnosis, for the disease may be made worse by the trauma. Perhaps the best way to reach a positive diagnosis is by withdrawing some of the joint fluid and by injecting it into the abdomen of a guinea-pig. If the joint be tuberculosis the animal will die of tuberculosis within six weeks. In case of doubt, the rule should be to wait and watch the joint for a few months.

From cases in Type II. the disease is differentiated by its evidences of active inflammation, by the absence of bony growths about the joint, and by the Roentgen picture. This shows a worm eaten appearance of the bone, rarefying osteitis in places, and if the disease is slow, areas of increased density.

An hysterical joint presents a total disproportion between the objective and subjective signs. While the patient complains of great pain, evidence of any

anatomical change is lacking. If the patient's attention can be diverted, the affected joint can be manipulated without pain. A search will reveal hysterical stigmata.

Sarcoma and *benign myeloma* occur in the metaphysis, ***but never involve the joint.*** The swelling and sensitiveness are above or below the joint in the end of one bone. The other bone is uninvolved. Motion is little restricted if at all, and then only by mechanical interference.

Scurvy in civilisation is seen in bottle-fed infants, comes on rather suddenly, and is characterised by a very painful swelling near the joint. The child screams with pain when it is moved, and often has bleeding gums and hemorrhages into the skin and mucous membranes. Raw fruit juice causes the symptoms to disappear quickly.

"Sprains" may cause confusion in children. Immobilisation for a few weeks will cure all sprains.

Intracapsular fracture, and separation of an epiphysis are distinguished by the Roentgen rays.

Charcot's joint is a local manifestation of tabes dorsalis or syringomyelia. The evidences of one of these diseases will be present. Pain is absent. Disorganisation exists rather than inflammation. The joint is loose and "wobbly", grates and creaks and contains fragments of bone and cartilage. Motion is unrestricted. The onset of a Charcot joint is usually sudden—it fills quickly and painlessly with fluid, and the subsequent swelling extends well beyond the limits of the joint cavity.

GENERAL TREATMENT.

As in any form of tuberculosis, so in this, constitutional treatment is most important. The presence of a tuberculosis joint implies a poor resistance to the disease, and it is most important that the patient's general health be kept at the highest possible pitch. Good food and plenty of fresh air for the entire day and night, are essential. The patient must sleep out-of-doors if he can. Sleeping in the open air is practicable for almost everyone. No form of climate is specific against the disease. The seashore agrees with children, but simply because it seems to improve their general condition. Adults with a complicating pulmonary lesion should live in a high, dry climate if they can.

The digestion must receive careful attention. Adenoids and diseased tonsils must be removed.

Drugs are useless except to meet special indications. Cod liver oil is an excellent form of fat for the winter months.

LOCAL TREATMENT.

In our study of the pathology and of the symptomatology we have learned two most significant facts, 1st. The existence of tuberculosis in the region of the joints is dependent upon the presence of the synovia and the lymphoid marrow. The presence of the lymphoid marrow and synovia is dependent upon function. If function be removed, these two tissues disappear. If they disappear the disease dies out, because it has no food. It is starved out. All nature's efforts are expended to deprive the joint of function. 2nd. A secondary infection by pus germs greatly adds to the dangers of the disease. Therefore, our two main rules for treatment are: 1. Deprive the joint of function. 2. Avoid secondary infection.

Radical operations on children's joints are often ineffectual, because lymphoid marrow is found in the shafts, and we have no way of telling just how far the disease has spread. These operations cause unsightly and crippling deformities by interfering with the centres of growth in the ends of the bones, and the testimony of those who have practised conservative treatment is to the effect that tuberculosis joints in children can often be cured thus with function. Again, it is possible to carry through with a child a long course of treatment that would be impracticable for an adult. Therefore, in children the treatment is almost invariably conservative. We carry it through in the face of almost every obstacle until all hope of saving the limb is gone. Then we amputate to save life. Beginning ankyloid degeneration, or a prolonged septic absorption may demand amputation.

In adolescence we adopt conservative treatment until growth is finished, or almost finished. Then, if the disease be not well, we adopt the measures suitable for adults.

Conservative treatment is rarely if ever successful in adults, and is almost impossible to carry out. Under the best circumstances the only thing we can possibly hope for is a stiff joint. This we can attain by operation in a few months, and can certainly cure the disease. Therefore, we maintain that the treatment of a tuberculosis joint in an adult is almost invariably radical. Bearing in mind, however, the statement of some authorities that occasionally the milder forms recover under conservative treatment, and bearing in mind the fallibility of our diagnosis, it is often well to try conservative measures for a few months. Then, if the joint be not much improved, and if we be sure of our diagnosis, radical treatment is in order.

The object of conservative treatment is to deprive the joint of function temporarily; the object of radical treatment is to destroy the function in the joint, to deprive it of function permanently.

(To be continued.)

FURTHER REPORT ON NITROUS OXIDE-OXYGEN ANESTHESIA.*

SOUTHGATE LEIGH, M. D.,
Surgeon in Charge, Sarah Leigh Hospital, President Medical Society of Virginia, Etc.
NORFOLK, VIRGINIA.

Having, in conjunction with my associate, Dr. Culpepper, previously discussed the subject of Nitrous Oxide-Oxygen Anesthesia quite fully before other societies, my purpose now is to relate some further impressions based upon wider experience with the anesthesia.

We have had in all of our hospitals fifteen hundred cases. While this number is small compared with the larger clinics, yet it is large enough to justify us in drawing certain conclusions, and making some positive statements.

In this number of consecutive cases, *there has not been a single fatality* that could be traced either directly or indirectly to the anesthetic. Further, there have been no post-operative complications, such as pulmonary embolism, stomach dilatation, pneumonia or nephritis. There were only two cases of phlebitis, in each of which there seemed to be a special cause outside of the possible effect of the anesthetic. A number of the cases were such bad risks that we would not have dared to give them chloroform or ether. The list embraces practically all varieties of surgical and gynecological operations, and includes the removal of tonsils and adenoids.

The ages of the patients varied from a few months to eighty years. The average length of the operation was about 40 minutes. We use the anesthetic in our longest operations, though we have never operated on one case longer than an hour and a half. We are opposed to prolonging operations beyond that point.

Blood pressure does not appear to be affected by our method, though we have recorded it in only a limited number of cases. Shock seems to be much less than with ether or chloroform, and our opinion is that the anesthetic itself produces no shock. We follow the rebreathing method, as advocated by Gatch, using a fresh mixture every two to four minutes.

Our whole apparatus is simple, less costly than others on the market, and consists essentially of a mixing chamber with a bag below, the chamber being connected with two nitrous oxide and one oxygen cylinders, and having on top a small deep cup for ether. A large tube conveys the mixed gases to the inhaler. A rubber cup connects the inhaler with the face and effectually excludes air*.

An essential feature of our improved method is that there *is at no time the slightest cyanosis*. This we *always insist upon*, and, we believe, it makes the method practically free from danger.

The cost is approximately fifty cents an hour.

Following Dr. Crile's excellent advice, we precede the anesthesia by morphia, though we combine it with atropia instead of scopolamin. We also infiltrate the tissues "before the knife" (by Crile's method) with novocaine, which we believe to be a distinct advantage. This infiltration helps us in several ways. First, it lessens shock. Second, the incision may be made more promptly. Third, relaxation is facilitated. Fourth, it lessens the pain from the sutures afterwards.

The time-saving advantage of nitrous oxide-oxygen deserves more than passing notice. It is our custom to start the final preparation of the skin as soon as the anesthesia is begun. The moment the towels are in place, the skin is infiltrated and the operation proceeds. After the operation, by the time the dressings are applied, the patient is wide awake, usually in a more or less pleasant frame of mind, and he may at once be carried to the ward without fear of disturbing other patients.

Nitrous oxide-oxygen is undoubtedly exceedingly difficult to administer in a satisfactory and systematic manner. To be successful with it the anesthetist must be well suited for the work. The study should be a pleasing one to him, he should be well endowed with common sense and should be tactful in the handling of the patients. One cannot properly master the work with less than six months of careful training and experience, and longer would be better.

It may be presumptuous on my part to take issue with some surgeons, but frankly I cannot agree with the prevailing tendency to go outside of the profession for anesthetists. In my humble judgment, the anesthetist, whether man or woman, should, to start with, be a well educated physician. In making this statement, I mean no possible reflection on the work which is done at some of the large clinics, especially with ether. I have only the greatest admiration for the perfection attained by these splendid workers. They are, however, the exceptions. I still maintain that for the surgical profession in general, it is better and safer to have trained physicians to do the anesthetizing. We have been only too slow in taking steps to safe-

* Read before the Southern Surgical and Gynecological Association, Dec. 17-18-19, 1912, Old Point, Virginia.

* We have been using nitrous oxide for many years. During the past three years we have developed our apparatus and method coincidentally with, but independent of, other workers. Our efforts have been especially directed towards simplicity and safety.

guard our anesthetic work. Many remember the time, only a short while back, when the anesthetic, even in difficult cases, was entrusted to the most unskilled and least trained assistants. We have taken a step forward in demanding trained anesthetists. Don't let us go backwards by making anesthetists of untrained people. With nitrous oxide-oxygen it is more of an advantage than a disadvantage that an expert is absolutely essential.

The beginner, with this method, should see the anesthetic properly given as much as possible, and should himself start with the simplest and shortest cases.

There is a number of difficulties in the way. The patient goes under so quickly, and recovers consciousness so promptly, that the equilibrium of complete and relaxed anesthesia is so extremely sensitive as to be difficult to maintain. The anesthetist has to be "on the job," to use a slang phrase, every moment of the time.

Ether, if used, must be added most judiciously. In more than half of our cases, we use none at all. In most of the laparotomies we use a little at the time when complete relaxation is demanded. The amount employed varies from a few drops to two drachms. In the rebreathing method ether cannot be given in any considerable amount without bad effect.

Those of us who advocate nitrous oxide-oxygen are obliged to admit that relaxation is the most difficult problem that confronts us. To accomplish this without producing the least cyanosis, is the problem that requires the expert to solve. This is the rock on which have foundered many would-be users of nitrous oxide, and from this difficulty, directly and indirectly, have emanated the unreasonable and unjust criticisms of the method. Admitting that an expert is necessary to properly administer the anesthetic, one well trained in this particular anesthetic, and not simply an etherizer, no one should criticize the anesthetic because untrained anesthetists usually working with faulty apparatus and methods, have had uncomfortable and disastrous results. As well may we criticize surgery because of the bad results following the work of untrained operators.

Surgeons should be fairer in their criticism, and should base their opinions on the work of such anesthetists as Gatch, formerly of the Johns Hopkins Hospital, Grile's excellent assistant and Culpepper of our own clinic.

One of the minor difficulties of nitrous oxide-oxygen is the occurrence of nausea. Fortunately it is very rare. Strict preliminary preparation of the patient will prevent it. When it does occur, the mask has to be removed and the patient regains consciousness. The operation is stopped, but only for two or three minutes, when the patient is again asleep. Nausea after the operation does not occur, or is very slight. This is one of the most attractive features of nitrous oxide.

As yet we have not used the anesthetic in negroes, since by our method the amount of oxygen needed is regulated by the color of the skin.

The advantages of nitrous oxide-oxygen over ether or chloroform are many and important. No description of the method can do it justice. One must see the administration properly carried out to appreciate it fully.

The depressing effects of chloroform are not seen. The anesthetic seems to be perfectly safe. In our cases, we recall not a single one where the anesthetic added a particle to the risk.

The disagreeable features and irritating effects of ether are lacking. There is no fear on the part of the patient, the gas is pleasant to smell and taste, it causes no suffocating feeling, its effects are very prompt, the patient going under in from one to four minutes and recovering consciousness just as quickly. There is no irritating effect on the respiratory tract, no mucus formation, no irritating effect on lungs or kidneys. Delirium is rarely present before, during or after the operation. Nausea is either absent or reduced to a minimum.

What more could we desire? Is this not a well nigh perfect anesthetic?

Then why is it that so many prominent surgeons are not using it at all, or only in selected cases? I have personally talked with many of them, and there are many answers to the question.

Some have perfected their method of administering ether to such an extent, and have such splendidly trained etherizers, that they are unwilling to make a change. Some have been influenced by adverse reports coming from sources where usually untrained anesthetists or faulty methods were employed. Others have the idea that the apparatus is complicated and the method costly. The main reason is that they have not seen the anesthetic given in a way that would properly demonstrate its overwhelming advantages.

Opinion is, however, rapidly changing. Even our own modest clinic has been visited by quite a number of surgeons and anesthetists, and without exception, as far as we could judge, they have been most favorably impressed by the method, the majority of them stating that they personally would not take any other anesthetic if they had to be operated upon themselves.

The complicated and expensive machines which have flooded the market have done as much as the untrained anesthetists to bring the method into disrepute. I believe, however, that the profession is rapidly getting to view the matter in its proper light, and I think I can safely predict that in a year or two there will hardly be a well equipped hospital in this country that will be without a proper apparatus and a well trained anethetist administering what is undoubtedly so far the safest and best of anesthetics: nitrous oxide-oxygen.

MILITARY SURGERY.

By GUSTAVUS M. BLECH,
CHICAGO.

PART II.

Weapons and Their Effects on the Human Body.

Introductory Remarks.

In the following lines an attempt will be made to briefly describe our modern armament and their injurious effects on the human body. We shall limit the discussion to the weapons used by American forces. It would be, of course, more rational to study the "instruments of destruction" used by foreign armies, as our wounded will suffer from them and not from our own weapons. The fact is, however, that the technical sciences which place at the disposal of nations modern weapons for attack and defense are as universal as is medical science. While each nation is encouraging inventive genius to improve the effectiveness of modern arms and their projectiles, from a purely medical point of view they are all alike. It is not very likely, by the way, that revolutionary innovations will be advanced for some time to come.

I only desire to invite attention to the fact that surgeons in the field will be restricted to treating injuries produced by military weapons. Fractures, dislocations, and extensive injuries of all kinds are suffered by military personnel the same as men in other walks of life and many an acutely inflamed appendix has been excised and many a pleural cavity, liver, brain, etc., opened for pathalogic processes encountered almost daily in our large civil hospitals.

VIII.

MILITARY WEAPONS AND BALLISTICS.

The civil surgeon who has only an opportunity to observe gunshot wounds from revolvers and similar weapons used in civil life, cannot adequately appreciate the character of wounds likely to be encountered in time of war, without the possession of some elemental knowledge of modern firearms and the manner of shooting missiles-ballistics.

Such knowledge, furthermore, is *conditio sine qua non* for medico-military tactics.

The history of the development of present day military weapons from the crude, cumbersome and imperfect guns used during our revolutionary, Mexican and civil wars is of great interest to military surgeons, but lack of space forbids more than a mere allusion. Suffice it here to say that military men believe to have reached almost the ideal: rapid loading, quick firing, an almost incredibly large range and great effectiveness.

While modern armies are continually on the alert for improvements it is not believed that anything can be discovered, as far as weapons and projectiles are concerned, that is likely to revolutionize the present science of warfare.

The weapons used by modern armies are not all alike. But they all are built on the same mechanic principles and the ballistics are not different enough to merit special study by military surgeons. Knowing the weapons and ballistics adopted by any one first-class power means knowing them all.

For our purposes it is deemed best to divide military weapons into three main groups:

1. Cold weapons,
2. Firearms,
3. Accidental objects.

1. Cold Weapons.

These are: *saber, lance* and *bayonet.*

The *saber* is the weapon of practically all mounted troops (cavalry). Fighting with it is, of course, possible, only in hand-to-hand conflict (mellay).

Military authorities tell us that the saber is not only a useful instrument of attack and defense in mellays but to a certain extent even superior to the pistol. The reason is that a pistol once emptied of its projectiles cannot be reloaded during a charge (so-called shock tactics) while the saber is always available.

At present the tendency seems to be to rely on the pistol as the more suitable "side-arm" for officers accompanying dismounted troops. It seems to me that even infantry organizations cannot abandon shock tactics and that their officers may find occasion to use the saber the same as mounted officers, but at any rate military surgeons will undoubtedly see a goodly number of saber wounds, though very rarely as compared with gunshot wounds.

Lances are staffs of steel, wood or bamboo, nine feet in length. The front end is usually sharp and pointed or spear-shaped. It is a thrusting instru-

ment furnished to certain foreign cavalry troops (lancers). While the greater length of the lance gives it an advantage over the saber it has found no favor with our own army undoubtedly because it has certain disadvantages outweighing the advantages.

It is too long an instrument to be used in wooded terrain; on the open field it renders the troops conspicuous; in shock tactics it can hardly be used more than once, a disadvantage which has led some armies to equip the front rank only with lances and the remaining ranks with the saber.

While witnessing maneuvers by Russian cossacks the author noticed that they had the lances strapped to the right foot. When approaching the enemy at a gallop they drop the lance to a horizontal position and thrust it against horse or man with the foot, leaving the hand free to fight with the saber.

The *bayonet* is a short knife-like weapon, the handle of which is so arranged that it can be easily attached to the muzzle end of a rifle. Some nations like the Russians prefer a hollowed triangular bayonet. Of course the front end is fairly sharp. The merits of either will be discussed later on in connection with wounds in general.

2. *Firearms.*

Firearms may be grouped as:

(a) Portable hand arms (rifles, carbines, pistols, revolvers, handgrenades).

(b) Artillery guns (field, mountain, and siege cannons, mortars).

(c) Explosive weapons of a mixed character (mines, bombs, etc.).

Machine guns, so-called, form an intermediary between portable hand arms and artilley.

(a) Portable Hand Arms.

The modern military *rifle* and *carbine* are practically one and the same, at least in the United States. Formerly the difference between the two was the shorter length of the barrel for the carbine, which was intended for cavalry troops. The latest pattern infantry rifle (Springfield) is so short that it is equally suitable for mounted troops.

The U. S. Army rifle is a breech-loading magazine rifle of 0.3 caliber.

Caliber refers to the diameter of the missile—the bullet proper. In foreign countries the diameter is expressed in millimeters, in this country the diameter is expressed by the decimal part of an inch. To illustrate: A revolver freely spoken of as having a 45 caliber really means that the diameter is 45-100 of an inch. It should be written either 0.45 or, as is customary, .45. The U. S. Army rifle, therefore, fires a projectile of .30 calibre (=3-10=30-100 of an inch).

To appreciate the meaning of the designation "breech-loading magazine rifle" it is necessary to recall that in olden times powder and ball had to be jammed down the barrel via the muzzle. The expulsion of the bullet was obtained by igniting the powder charge through an opening in the barrel near the breech. This was accomplished by taper, flint-spark and finally by percussion caps. The present manner of loading and firing has become possible only through the invention of the modern cartridge. In the modern cartridge, as must be known to every one who has seen a so-called center-fire cartridge for ordinary revolvers, missile, powder charge and percussion cap are held together in and by one shell.

The principle of the modern magazine rifle is illustrated by the accompanying figure (Fig. 1). Five cartridges, held together by a metal clip, are inserted into the interior of the rifle—the magazine—and fired one after another. Reloading becomes necessary only after all five cartridges have been shot off.

From a military point of view the possibility of loading five missiles in practically an instant and

Fig. 1.

firing them as quick as aim can be taken, means, of course, a tremendous technical advance as compared with the old-fashioned muzzle-loading guns.

But as surgeons we are principally concerned with the ballistic changes which the new rifles and missiles have brought about.

If we carefully examine the interior of the barrel of any high-grade rifle, preferably by reflected light, we will see that the bore is not smooth, but to have several spiral grooves. These are placed for the purpose of imparting to the missile a rotary movement. It is this motion which prevents the elongated, pointed projectile to pass in its flight through the air point on.

Accordingly we have two motions. The pressure of the powder gases forces the bullet into space virtually in prolongation of the barrel line, which motion is technically known as "translation," and the twists in the barrel—rifling—impart to it "rotation."

The frequency of the rotary movements depends on the number of twists in the barrel, a problem requiring a good deal of mathematical calculation by modern gun makers.

I have just said that translation occurs ***virtually*** along a line in prolongation of the barrel. In

reality the flight of the missile, unless the barrel is pointed from above downward, is in the shape of a curve.

To illustrate let us assume a rifle to be held in a horizontal position of mathematical exactness. The bullet fired from such a position would keep on flying in prolongation of that line forever and ever were it not for the law of gravity and the resistance encountered by the air. Both tend to cause the bullet eventually to fall to the earth. Though not noticeable to the naked eye the line of flight—the trajectory—represents a half curve, with the zenith at the muzzle.

The speed—velocity—with which a projectile passes from the muzzle to the target is a problem of great interest to military surgery. For very short distances it can be simply said that the speed is tremendous, for a missile fired from a modern military rifle would reach a target say 900 feet from the muzzle in less than a second. In actual warfare, however, shots are fired at great distances and injuries received under such conditions vary, of course, from those received at close range. This can be explained by the difference in so-called initial and remaining velocities.

Initial velocity, as the term implies, refers to the speed with which the projectile issues from the muzzle of the gun. All calculations are based on the number of feet or meters the projectile passes in one second—the so-called foot-second (or meter-second) system.

This method of calculation permits exact valuations. Thus we know that a revolver averages an initial velocity of 700 foot-seconds, while a modern military rifle can reach as high as 2,400 foot-seconds. But in the course of the flight the missile has to overcome gravity and air friction; these serve to reduce the speed. This is noticeable at diverse points away from the muzzle and is designated—remaining velocity. Let us assume, for illustration, that a projectile issues at an initial velocity of 2,000 foot-seconds; at a point 500 yards from the muzzle the velocity will be reduced to 1,000 foot-seconds.

Our present army rifle is sighted up to 2,850 yards (approximately one and three-quarters of a mile) but by elevating the rifle to an angle of about 45 degrees a range of 5,465 yards can be attained. The time of flight would consume a trifle more than half a minute, to be exact 31.36 seconds.

A word about the projectile.

The greater initial and remaining velocity of the military rifle bullet, as compared with the ordinary revolver missile, depends primarily on the powder gas pressure. The higher the explosive force of the powder the greater the velocity, other things being equal. Military cartridges are charged with the best obtainable so-called smokeless powder, whose composition is not given in detail by the manufacturers. Military surgeons should know something of the shape and composition of military projectiles. As will be seen later on the ordinary revolver bullet affects tissues differently than the military projectile. The reason is that the former consists of 95 parts soft lead, hardened with five parts antimony. The rifle bullet is considerably longer, more pointed and jacketed by a harder metal, such as German silver, copper, cupro-nickel, steel, etc.

Naturally a projectile of soft metal is easily deformed and easily stopped; a jacketed bullet, however, has greater penetrating power and retains its original shape. This is the reason why modern military missiles have been repeatedly described as "humane." We shall soon learn whether this designation is justifiable.

Revolvers are being withdrawn as military weapons and in their stead *magazine pistols* (automatic) are furnished. All that has been said about the rifle holds good also for the automatic pistol, except that its range is considerably less.

Hand-grenades, though properly classed as a portable firearm, will be discussed in connection with bombs.

It may not be amiss to devote right here a few words to the so-called *machine-guns,* which form, as already mentioned, an intermediary class between artillery and portable weapons.

I prefer to discuss them now because the projectiles are identical with those described above for magazine rifles. Indeed a machine gun is nothing else than an infantry rifle that is loaded and fired by some mechanical contrivance.

Inasmuch as some machines can fire over a thousand shots a minute surgical interest in them will be limited to the possibility of their inflicting several wounds in one and the same individual practically at one and the same moment.

(b) Artillery.

The mission of artillery is to destroy animate subjects and inanimate objects of military importance (buildings, bridges, forts, ships, camps, opposing artillery, etc.) all of which must be often accomplished at great distances.

Field artillery organizations in the United States are equipped with modern *breech-loading cannons* (often referred to as "rifle" or "piece") of 3-inch caliber. These cannons are fixed on wheels and

are drawn by horses, as are their attached wagons carrying their ammunition (caissons).

Mountain guns have the same caliber as field guns but are so arranged that guns, carriage, ammunition, etc., are carried on pack mules for use in mountainous terrain.

A field gun has a maximum range of 6,500 yards (more than three miles), a mountain gun is limited to a range of 5,800 yards.

The United States carries in reserve heavier guns, so-called *siege guns* or *howitzers*. One has a caliber of 4.7 inches and a range of 8,000 yards, another with a still larger caliber of full 6 inches has a range but 200 yards longer than the field gun.

Field artillery uses two kinds of projectiles: *shrapnel* and *common shell* filled with high explosives.

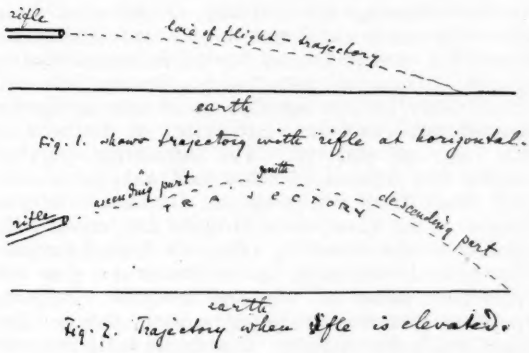

Fig. 2.

If the weapon be elevated the least bit, the trajectory represents a full curve with the zenith in the middle of the path.

Illustrating Trajectory of Elevated Gun.

The initial and remaining velocity of shrapnel fire is of no interest to us because wounds created by shrapnel are entirely independent of the velocity with which the projectile issues from the muzzle and maintains its flight.

This statement may appear paradoxical in the light of what has been said above on the importance of velocity, but the explanation is found in the peculiarity of this projectile.

Essentially shrapnel is a cylindrical shell containing in its interior a powder charge and a large number of round, lead bullets of .5 caliber. In front of the shell, the so-called nose, is a time setting arrangement, a time fuse, which can be set to ignite and explode the powder charge in the case practically at any distance from the muzzle. Explosion will take place also on contact with some solid object.

In order that the lay reader may still better understand the use of shrapnel I will interrupt the description to continue it in connection with an imaginary concrete example.

A battalion of the enemy is reported lying down on the ground preparatory to intrenching itself say two miles away from our line.

The time fuse on our shell is so set that when the projectile is about eighty yards in front of the battalion it will burst. The "nose" flies off and the lead bullets are thrown forward and downward against the enemy. To this must be added that in some countries the thin shell bursts into fragments, while in others it is too thick and falls down on the ground.

We see that the velocity of the "mother shell" can have little if any influence on shrapnel effect, for the force to the individual bullets is given by the explosion in the shell during its flight.

The ballistic properties of these bullets cannot be successfully formulated as conditions are not uniform. The charge, the height of the shell and the accidental direction of the bullets all influence their effect. For the present it must suffice to state that these bullets are capable of producing serious injuries in animate subjects even to the extent of shattering bones, and again they may fall down without any appreciable effect.

Against soldiers under cover shrapnel is useless.

Furthermore exact aiming, as is done with the infantry rifle, is out of the question, but this does not lessen its effectiveness when fired against a mass of troops, for the "flow" of bullets covers a radius from 175 to 250 yards in depth and about 25 yards in width.

The *common shell* (steel) is loaded with a high power explosive, which is exploded almost immediately on striking the earth or some solid object. This shell has no time fuse but one that acts on concussion.

Practically all that has been said about the ballistics of the 3-caliber magazine rifle holds good also for these larger artillery weapons. The only difference is that artillery projectiles have a slower initial velocity and that the remaining velocity is not lost as rapidly as with the rifle bullet.

When explosion of the projectile takes place the shell bursts into many fragments of variable size. If it is taken into consideration that these shells are used to destroy large structures, brick walls, etc., one can easily imagine their effect on human tissue.

It goes without saying that the *mammoth guns of the coast artillery* and the larger *naval guns* which throw enormous projectiles with the expectation of destroying battleships whose walls are covered with thick steel plates, are too gigantic to require exhaustive investigation by military surgeons. Struck by a fragment from such a projectile, one is lucky indeed if he escape with a limb torn from the body;

struck elsewhere in the body, instant death is inevitable.

Mortars to all intents and purposes are short barrel cannon of variably large caliber whose projectiles are utilized to reduce very strong fortifications.

(c) Explosive Appliances.

Hand grenades. There are so many varieties that a detailed description of even the most popular forms is entirely beyond the frames of a medical work. But as they are apt to be used in the future a brief description of this appliance is necessary.

During the war with Japan the Russians made hand grenades from obsolete shell, rapid-fire cartridge cases, tin cans, fused slabs of gun cotton or bags of dynamite, and tin paint drums.

Major Kuhn, U. S. Army, in his official report to the War Department, says: "All these are, in effect, nothing more than high explosive 'firecrackers,' the fuse being the ordinary taped fuse used in commercial mining and blasting, was first lit by match or punk and the grenade then thrown by hand."

Mines are utilized to destroy ships either by contact or through electricity, both producing explosions of the high power charges. They will be rarely adaptable for warfare on land.

(3) Accidental Objects.

To these must be reckoned all projectiles that have been interrupted in their course of flight by striking some solid object with sufficient impact to be thrown into a different direction than was originally intended (ricochet).

Such a projectile becomes under such a condition an indirect missile.

In a somewhat similar manner almost any object in the vicinity of the target may become indirect but dangerous missiles. We need only think of the splinters on battleships, of branches of trees, pieces of stone in land battles, etc.

Experience has shown that objects worn on one's person (cigar cases, coins, pocket knives, buttons, etc.) may become indirect missiles. Even parts of a human body have been known to cause injuries. Thus V. Oettingen is responsible for the statement that a rib from a sailor shattered by a shell pierced the lung of a nearby comrade.

Bandages applied to the thigh have a habit of slipping down, and plaster may so bear at its lower end as to cause excoriation. Any bandage of the thing which does not encircle the pelvis should be suspended by adhesive strips or shoulder strap.—Bernays' Golden Rules of Surgery.

REPORT OF POST-OPERATIVE CASES.[1]

COMPOUND FRACTURE OF SKULL; FRACTURE OF THE OLECRANON TREATED BY THE OPEN METHOD; COMPOUND FRACTURE OF PATELLA; COMPOUND FRACTURE OF HUMERUS; ATYPICAL EXOPHTHALMIC GOITER.

GEORGE DE TARNOWSKY, M. D.,
Instructor of Gynecology, Chicago Policlinic; Attending Surgeon, Chicago Union and Ravenswood Hospitals; Surgeon to the Northwestern Eleveated Railway Company, Chicago.

CHICAGO, ILL.

CASE 1. COMPOUND FRACTURE OF THE SKULL: This patient, 50 years old, is a conductor on one of the elevated trains. On November 30th, 1910, he was adjusting the couplings of two cars while the train was in rapid motion and inadvertently allowed his head to project beyond the car platform, thereby coming in contact with a station platform. Fortunately he was not thrown off the car by the impact, but was found unconscious on the floor of the front car platform. The right fronto-parietal region was crushed in, blood and brain tissue oozing freely from the compound fracture. He was rushed to the Ravenswood Hospital and immediately placed on the operating table. A hasty examination gave the following data: Stertorous, slow respirations; pulse 72, thin and irregular, pin-point pupils not reacting to light or accommodation. Patient totally unconscious. The entire scalp was prepared by shaving, followed by the application of Harrington's solution and tincture of iodine. No scrubbing with soap and water was allowed.

Using two of the scalp wounds as starting points, a large horseshoe flap was made, denuding the fractured area. Five pieces of bone were found imbedded in brain tissue. These were removed and temporarily placed in physiological salt solution, kept at body temperature. The lacerated brain tissue was trimmed off and several bleeding points in the dura and pia were ligated. The fronto-parietal lobes were then gently irrigated with saline solution and many spicules of bone either washed out or removed by forceps. The five pieces of bone were next replaced after trimming off rough edges, and their periostal coverings were sutured together with interrupted 20-day catgut sutures. The skin flap was replaced and sutured with silk worm gut. One small iodoform gauze drain was introduced, extending through a small triangular bony defect to brain tissue. No attempt was made to suture pia or dura, as both were hopelessly torn to shreds.

The patient was returned to his room in fair condition. He remained unconscious for 48 hours, during which time his temperature hovered around 100 degrees, with a slow pulse. No focal symp-

[1] Read at the January meeting of the North Shore Medical Society.

toms developed at any time. The drain was removed on the third day and the scalp sutures on the eleventh, the patient going home three weeks after the accident. Two years have now elapsed, during which time he has continued his duties as conductor. Bony union took place, no hernia developed and the scars are hardly noticeable. He suffers from no physical or mental impairment.

I report this case in order to emphasize the importance of preserving all parts of the cranial vault that are still covered by periosteum. Where the fragments dovetail into each other satisfactorily no suture of periosteum is necessary, but with crushing fractures in which many loose spicules of bone have to be removed retention sutures are indicated.

Case II. Fracture of the Olecranon Treated by the Open Method: This patient, 59 years old, was riding a bicycle on the 26th day of September, 1912, when he was accidentally struck by an automobile and thrown. In falling, his left flexed elbow struck the curbstone. I saw him within ten minutes of the accident. The left elbow presented the characteristic cup-shaped depression seen in recent fractures of the olecranon. There was a separation of fragments of over one inch. After unsuccessfully attempting to appose the fragments with the arm in extension, I advised immediate suturing as productive of the best results.

He entered the Ravenswood Hospital and was promptly etherized. A hematoma the size of a small orange had meanwhile formed, totally obscuring all bony landmarks. A posterior incision 3 inches long was made through integument and fascia, exposing the two fragments. The hematoma was evacuated, the parts irrigated with normal saline solution and the fragments coapted with forearm in extension after trimming off several spiculae. Three linen thread sutures were applied, one in the center, two laterally, passing through the tendon of the triceps muscle and periosteum. When these were tied apposition was found to be perfect. I then made downward traction on the tendon of the triceps while my assistant slowly brought the forearm to a right angle. The fascia was closed by catgut and the skin by interrupted silkworm gut. A small drain was left *in situ*. The limb was dressed by means of antero-posterior right-angled splints.

The drain was removed in 48 hours, the sutures on the 10th day. The right-angled splints were maintained for four weeks, at the end of which time they were removed and slight passive motions were begun. Two weeks later the patient was allowed to use weights and to exercise the elbow more vigorously. Ten weeks after the accident normal motion of the elbow had been restored.

In this connection I wish to emphasize the following points:

1. Fractures of the olecranon are best treated by the open method. In simple fractures immediate intervention is indicated; in compound fractures it is preferable to wait until primary reaction has subsided.

2. It is not necessary to wire or suture through bone. The periosteum and tendon of the triceps are sufficiently strong to maintain the fragments in apposition, provided the triceps is not allowed to contract. Antero-posterior angle splints absolutely prevent contraction of the triceps.

3. The most religious asepsis must be observed during the operation, Mr. W. Arbuthnot Lane's technic for bone-plating being used by myself as a standard. No antiseptic irritants must be used for irrigation or swabbing.

4. Immobilization must be maintained for four weeks before passive motions are allowed.

Case III. Compound Fracture of Patella. On May 20, 1912, this young man, sixteen years old, had climbed up onto the elevated railway structure and was running to reach a station when he was struck by a train and thrown on the opposite track. He fortunately did not come in contact with the third rail. On admission to the Ravenswood Hospital, he was found to be suffering from multiple wounds in various parts of the body, the only serious injury being a crush of the right patella. The minor wounds were treated in the ordinary manner. Immediate treatment of the patella consisted in trimming the wound edges, irrigation with normal saline solution and the free application of Harrington's solution and tincture of iodine to the surrounding parts. Hot wet dressings were applied and the limb was immobilized in extension.

No infection of the wound having occurred, the patient was anesthetized on the fifth day. Utilizing the open wound as part of the incision, the patella was freely exposed by the usual U-shaped incision. A stellate fracture of the patella was revealed. The fragments were trimmed of rough edges and their periosteum coapted by means of interrupted 40-day catgut. The incision was closed, with drainage, by means of silkworm gut. The drain was removed in 48 hours. Immobilization was maintained for five weeks, after which passive motion was allowed. The patient was allowed the use of crutches three weeks after the operation. Ten weeks after the operation normal flexion and extension had been restored. The excellent results obtained in this case are due to three factors.

1. An interval of five days was allowed to elapse between the day of the accident and the operative treatment.

In all compound fractures in or near joints I believe the best interests of the patient are conserved by a primary inactivity. Recently traumatised tissues offer much less resistance to infection than is normal, and by waiting for the primary reaction to subside we get better results. Had infection of the wound occurred, I should have waited even longer.

2. No wiring of fragments was allowed. As in the elbow case just recorded, sutures are amply sufficient, provided muscle contraction is overcome by immobilization.

3. No passive or active motions were allowed for five weeks after suturing of the fragments.

Case IV. Compound Fracture of Humerus: On January 19, 1912, this patient, 67 years old, flagman, was struck by an elevated train while walking along the tracks. He received multiple scalp wounds and a compound fracture of the right humerus in

its middle third, the distal fragment protruding freely through the lacerated skin. There was also a Colles' fracture of the same wrist. The treatment of the compound fracture consisted in irrigation of the wound, trimming of torn edges, reduction and immobilization by means of an external plaster-of-Paris trough extending from the flexed elbow up the arm and over the right shoulder, with a small wood-fiber internal splint. Drainage was left in the open wound for 48 hours. Healing was by primary intention. The humerus was inspected weekly for four weeks; no callus could be palpated and it was evident that no attempt at union was taking place. The fragments were irritated by friction without any results.

On February 10, 1912, the patient was anesthetized and an incision four inches long made just external to the biceps muscle. On freeing the middle third of the humerus a small blood clot was found between the fragments, but there was no callus and the bone was freely movable in all directions. After curetting out the clot and irrigating the fragments, they were accurately coapted and a four inch Lane bone plate applied. Fascia and skin were coapted by means of catgut and silkworm gut respectively. The limb was dressed and replaced in the same cast and splint. Bony union occurred very satisfactorily. Twelve months have now elapsed since the operation. The man has resumed his work; the bone plate does not cause any disturbance and will, of course, remain *in situ* until it does. Allow me to emphasize here also, that asepsis was the keynote of success.

CASE V. ATYPICAL EXOPHTHALMIC GOITER: This case is reported, not because of any difficulties encountered at the operating table, but on account of the patient's age and of the speedy indication for a second operation.

Mrs. S., 50 years old, had never complained of any symptoms referable to her thyroid gland. In August, 1911, following great mental anxiety, she noticed a rapid enlargement of the right side of her neck. On examination, a right lobe, the size of a large plum, was found. There was only a slight degree of exophthalmos; Von Graefe's and Stellwagon's signs were absent. The pulse varied between 120 and 144. There was a marked tremor of the hands. Sweating, dyspnea and profound exhaustion were also complained of. As the patient was unable to go to the hospital for several months, various internal remedies were tried without avail.

On January 4, 1912, she entered the Ravenswood Hospital, and on January 6th I removed the right lobe of the thyroid through the usual convex incision. Recovery was rapid. Sections taken from the lobe were reported by the pathologist, Dr. Moore, as showing typical hyperplasia without any colloid degeneration; there was no evidence of carcinoma. Nine days after the partial thyroidectomy the pulse was 86; the tremors and sweats were subsiding rapidly, and Mrs. S. decided to submit to an internal operation for chronic appendicitis. She left the hospital January 26 and resumed her business duties two weeks later.

For a period of three monthe she remained in excellent health. The Grave syndrome was absent; she gained in weight and strength and reported that she had not felt so well in years. On April 13 she reappeared with the statement that during the past week she had noticed a sudden enlargement on the left side of her neck. On examination I found the left thyroid lobe as large as if not larger than the one had been prior to the operation. Grave's syndrome was again present, and again the patient stated that she had been recently under great mental stress. Her symptoms continued to augment steadily and on July 4th she re-entered the hospital. On July 6th I removed the entire left lobe, leaving a small portion of the isthmus *in situ*. The parathyroids were, of course, carefully avoided in both operations. Recovery from the second operation was extremely rapid, the patient returning home on the fourth day. Over six months have now elapsed since the final operation. Mrs. S. is in excellent health. There is still a slight degree of exophthalmos, but the pulse is 82, respirations are normal and she is comfortable in every way.

The sudden onset of hyper-thyroidism at the age of 50, together with the extraordinarily rapid hyperplasia of the left lobe, three months after the removal of the right lobe, warranted me in reporting this case.

BONING OF THE THORACIC PRECORDIAL WALL IN CERTAIN AFFECTIONS OF THE HEART; REPORT OF CASE.*

J. E. SUMMERS, M. D.,
Omaha, Neb.

In collaboration with Dr. A. D. Dunn of Omaha, I am about to publish in the *American Journal of the Medical Sciences* an article entitled "Observations on a Case of Mediastinopericarditis Treated by Cardiolysis (Brauer)" I feel, however, that it would be unwise to let this opportunity pass without briefly drawing the attention to the importance of this operative procedure. Cardiolysis, or pericardiac thoracolysis (Kocher) has found no favor in America; why this is so is incomprehensible to me because the operation is based upon good mechanical principles, is not difficult of execution, neither has it a high mortality. The danger of the procedure is so inconsiderable in proportion to the good to be expected, that every physician should familiarize himself with the diagnosis of the conditions calling for the operation, and every surgeon should, in addition to this, learn the technic.

History. According to Brauer, whenever, in pericarditis, the heart becomes adherent to the pericardium, and the pericardium to the mediastinum, pleura, and chest wall, a great burden is added to the function of the organ. In systole it tugs against

* Read before the Western Surgical Association, December 21, 1912.

the bony chest, every beat being a strain upon its musculature; but the more evident the sign of tugging, the better the condition of the heart muscle, and the more surely will relief come to it if the overlying bony wall is removed, changing it "into a movable elastic wall formed solely by musculocutaneous flaps." Internal adhesions of the pericardium to the heart may not, of themselves, be of great moment, and usually are difficult to diagnose, but if, with their occurrence, the pericardium itself becomes adherent to neighboring organs, as the mediastinum, diaphragm, sterno-chondro-costal wall, the function of the heart will be interfered with in degree comparable with the elasticity of these adhesions. The chest wall itself, except in the intercostal spaces, yields scarcely any at all, consequently the heart muscle gradually becomes weaker and weaker as a result of the strain. It is in this latter condition, before the heart muscle itself is worn out, as evidenced by damming back symptoms, that Brauer proposes the operation of cardiolysis, or, as I call it, "boning of the precordial chest wall." If threatened heart insufficiency is not too marked, if the liver is not too large and ascites too great, much relief may be expected. But, above all, the patient must be one whose heart still responds to medication and relief from all strain; this in itself is proof that there is still tone in the heart muscle, and that it will be markedly benefited by untethering its fastenings to the chondro-costal chest wall. Hearts weaker than this will scarcely be benefited by operation and will tend to bring any operative procedure into disrepute. "Anatomically, and to a lesser extent clinically, pericarditis may be divided into the following types: diaphagmatic, pleural, chondro-costal and mediastino-pericarditis. The cases may be said almost never to be of the pure type. The existence of the chondro-costal type is necessary if we are to expect anything from operative interference. The heart is hitched fore and aft to the chest wall and to the vertebral column by involvement of pleura, pericardium, and posterior mediastinum. It is at this double pull that our therapy is directed. Another indication for removal of the precordial chest wall is brought forward by Morrison. In a patient with cor bovinum from mitral and aortic disease, who suffered from frequent and severe anginoid pains that resisted treatment, he removed 4½ inches and 5½ inches of the fifth and sixth ribs, respectively. The result was subjectively and objectively gratifying, so that the patient was able to earn his living, which he had previously been unable to do. He was reported much improved one and one-half years after the operation. Morrison's reasoning was as follows: Experiments show that direct muscle stimulation of the eviscerated heart induces contraction. The constant thumping of the heart against the stiff and confining chest wall gives rise to a cardiac erythism. Morrison believes that one of the causes of pain and increased irritability in greatly hypertrophied hearts is this impact of the forcefully beating heart on the chest wall. The substitution of a soft tissue covering for the heart instead of a bony wall, admits of free action of the hypertrophied heart without the constant hammering of the chest wall; in other words, the heart has more room in which to work. The term *cardiac decompression* is suggested in the place of thoracostomy as used by Morrison, because it better describes the purport of the operation" (Dunn & Summers).

Essentials for Diagnosis. The cardinal diagnostic signs of adhesive pericarditis are systolic retraction at the apex, the diastolic shock, epigastric diaphragmatic tugging, Broadbent's sign, and cardiac and pulmonary immobility. It must be differentiated from Pick's pseudo-cirrhosis of the liver, with its insidious onset, rapidly recurring ascities after puncture, intermission and remission with signs of involvement of the pericardium. In our cases the sphygmogram, cardiogram and phlebogram tracings, before and after operation, are remarkable as placing in written evidence the justifiability and benefits of the operative procedure.

History of Case. J. F., age 29, consulted Dr. Dunn, February 5th, 1912. He is single and is a florist by occupation. Formerly he was a steady drinker, but during the last two years he has drank almost none. It is to be noted that the *only illness he has suffered during his entire life was diphtheria followed by paralysis at eleven years of age.* The family history is negative.

The present illness began gradually, three years before, with "bloating", with tiring easily, and with shortness of breath on exertion. His condition grew rapidly worse and almost from the beginning he had been entirely incapacitated. He said he could not lie down without several pillows under his head, and he had spent his nights largely sitting in a chair; he could not move about without choking and coughing; he was able to eat but little and his bowels would not move without medicine; his urine was scanty and highly colored; he had had much yellowish sputum in which there were occasionally considerable amounts of blood.

The patient was a well developed young man. Dyspnea and orthopnea were marked. His face was a dusky red, the veins of his neck and face were turgid and a marked venous diastolic collapse was present. In the precordium a violent pulsation was to be seen, which consisted of a distant, rather slow systolic retraction with a rapid vibratory diastolic thrust of the left costal arch. Broadbent's sign

was present. The respiration was rapid and upper thoracic in type. A marked diastolic shock could be palpated. The apex lay in the 6th interspace in the anterior axillary line. Cardiac dullness extended 3 cm. to the right of the sternum and to the left as far as the anterior axillary line in the 6th interspace. The area of heart dullness did not change with change of position. Auscultation revealed a loud systolic murmur heard over the entire precordium; this murmur was best heard at the apex. All of the sounds were blurred; the heart action was rapid (120 per minute) and irregular. A second diastolic heart sound could be heard over the entire right ventricle. There was an obliteration of the left lower pleural cavity. The lower border of the left lung in the precordium did not move with respiration. The right pleural cavity contained a moderate amount of fluid.

The abdomen was much distended. The liver extended a hand's breadth below the costal arch in the nipple line: it was tender and pulsated; ascites was present; the scrotum, thighs, legs and feet were moderately edematous.

The urine was highly colored and sharply acid; the sp. gr., 1.030. Albumen and the aldehyde reaction were present; sugar was absent. Hyaline and granular casts and red blood cells were quite numerous.

The patient was placed in the Clarkson Hospital, where in the course of three weeks compensation was restored; the heart action became regular, the murmur entirely disappeared, and the heart sounds became clear. The patient's temperature was normal during the entire time.

Ten days later, March 13, 1912, cardiolysis was performed. The purpose of the operation was not only to untether the heart by doing away with the costo-pericardial adhesions, but also to give the enlarged organ room for freer play. A U-shaped incision commencing four inches from the sternum was made, with its base directed toward the left shoulder, the upper limb skirting the lower border of the second rib, as far as the sternum, thence the curved portion overlapping the left border of the sternum, to the cartilage of the sixth rib, the lower limb continuing downwards, outwards, and then upwards, to the enterior axillary line. A musculo-cutaneous flap down to the ribs was raised, and the third, fourth, fifth and sixth ribs and their cartilages, covered by their periosteum and perichondrium, were resected flush with the sternum. This exposed the pericardium and left pleura in an area measuring from above downward five inches, from within outward, four and one-half inches.

The pericardium was found adherent to the chest wall and the pleura somewhat thickened and adherent. It was not necessary to ligate the internal mammary artery as the costal cartilages were first divided externally to the course of this vessel and then the inner stumps were removed. The wound was closed with a cigarette drain in its lower inner angle; this drain was taken out at the end of twenty-four hours. The operation was followed by a mild broncho-pneumonia from which the patient's compensation was little disturbed. In other respects convalescence was uneventful and the man is today free from all of the distressing symptoms for the relief of which the operation was done.

There seems to be a difference of opinion as to whether or not the periosteum should be removed entirely. In my judgment it should, and in certain cases part of the sternum should be removed likewise. This latter has been done by several operators. The physician who refers the case should be present at the operation and assist the operator in deciding the amount of bone and cartilage to be removed.

Small openings into the pleura are not dangerous. They can be closed temporarily by gauze pressure, and later by suture. In very serious cases where it is expected that a large amount of the chest wall is to be removed, intra-tracheal insufflation anesthesia would lessen the operative risk.

As far as I am informed, there have been thirty-one instances of cardiolysis, including two unpublished cases of Lejars, and my own case. An operation was suggested by M. E. Weill, of Lyons, in 1895, with the object of breaking up adhesions between the pericardium and the heart, and another by Delorme in 1898,—a question of intervention of cardiac adhesions, or mediastino-pericarditis, the proposal in this latter being exposure of the pericardium, opening it and freeing the heart and its adhesions by breaking them up or sectioning them, a procedure comparable to pulmonary decortication. Neither of these has been performed, nor is there anything logical in them, since nothing would prevent the reformation of the divided adhesions. In a paper by Roux and Berger, published in *La Semaine Medicale,* September 7, 1910, entitled "Le Traitement Chirurgical de la Mediastino-pericardite Adhesive," a full discussion of Brauer's operation, and of the results obtained to date, may be found. They say, "in certain cases the effect has been frankly, bad or nothing at all. Nevertheless in the greater number of cases the success of the operation is acknowledged." They insist upon the fact that a long observation after the time of the intervention is essential for an opinion as to the value of the procedure. This is true and it is not, because in many of these cases the relatively hopeless outlook of a constantly strained heart musculature, leads only to a fatality, whereas, if the strain is relieved life is prolonged although the original lesion must of itself, all things being equal, shorten life. "In twenty-one cases clearly favorable results have been observed. Amelioration was even noticeable during the operation in some of the cases; the beating of the heart was stronger and more regular, respiration was calmer and narcosis easier; immediately

after operation the asystolic condition disappeared, also the dyspnea, edema, etc. However, in other operations the amelioration was more tardy, and in certain ones the condition was even aggravated after the intervention,—pulse weak, more marked dyspnea with cyanosis; but these disquieting phenomena disappeared and little by little a progressive amelioration took place; the palpitations ceased, the edema, ascites, and enlargement of the liver diminished and sometimes disappeared entirely, and a number of these patients who had been condemned to inactivity, were soon able to take up their occupations."

EXAMPLES.—"A patient, aged eighteen, operated by von Beck, was in perfect health two years after the operation, and was able to do gymnasium work. In Umber's patient, operated upon by Fritz König, the relief continued for two years and a half. Danielsen's patient, twenty years of age, a butcher, seen again nine months after the operation, remained in an improved condition, considered himself well, and was able to take care of his work again. Seen again *six months* after intervention, a case operated by Küttner, after having been in a desperate condition, had no pain and had been able to resume work. Another patient of Küttner's, aged twenty-one years, was enjoying life five months after the operation. In one of Schlayer's patients, the relief continued at the end of six months. The most favorable cases, and the only ones in which one can speak of the *real, lasting* relief, are those in which the patient is kept under observation for a fairly long time after the operation; in all the other cases there is no question that amelioration, often very remarkable, takes place immediately after the operation, or during observations for only a few weeks; these results show appreciable relief and deserve to be taken into consideration."

There are seven cases of failure and their study is important because they serve as indices in the establishment of the exact indications and contra-indications for operation. Of these, one died twelve hours after operation, from a progressive weakening of the heart, (Schlayer's case); in another (Poynton & Trotter) there was a temporary improvement but the symptoms reappeared with a fatal termination. Of the five others, one was not relieved by operation, but the case was complicated by mitral insufficiency; in another, the indications for operation were not present and the autopsy showed simply adhesion of the two leaflets of the pericardium, without other complicating adhesions, besides the patient was submitted to a series of abdominal operations, as decapsulation of the right kidney, splenopexy, hepatopexy, and omentopexy, all of which was a parody upon surgery, at best.

In the first of the two cases operated upon by Lejars, the symptoms insisted upon by Brauer, to make the diagnosis, and the index for operation, were not positive; no attempt at preliminary medical treatment, and rest in bed, was made; the patient died one month after operation. The same criticism may be made as to Lejars' second case, and the operative procedure showed "very small elements in favor of adherent mediastino-pericarditis. All of the symptoms persisted and two months after the operation the patient succumbed." It would seem that Lejars had not studied carefully the kind of cases in which cardiolysis is a hopeful operation.

Roux-Berger conclude, "if Brauer's operation is used only in cases which are clearly justifiable, in veritable mediastino-pericarditis adhesions, one will be right in expecting very good results, i. e., immediate great relief, and in truth, in a great number of cases, a permanently successful outcome."

To those who are sufficiently interested, I would suggest the study of the following papers, as they, with their references, contain, as far as I am informed, all that has been written upon the subject. I have found nothing in American literature.

BIBLIOGRAPHY.

Brauer. "Die Kardiolysis und ihre Indicationen," M. M. Woch., 1902, XLIX, p. 982.

Morrison, Alexander. "On thoracostomy in heart disease," Lancet, 7-4-1908, 11-20, 1909.

Lecene. "La cardiolyse ou operation de Brauer, ses indications et ses resultats," Archives des malades de cœur des vaisseux at du sand, 1909.

Roux-Berger. "Le traitement chirurgical de la mediastino-pericardite adhesive," La Semaine Medicale, 9-7-1910.

GASTRIC LAVAGE IN BILIARY COLIC.

When actual stagnation of bile arises from calculous obstruction in the cystic duct, pain becomes more constant, and there is usually tenderness in the gall-bladder area. In these paroxysms there is ordinarily pain in the pit of the stomach usually referred to the back, or to the right subscapular region, and much more rarely it is referred to the left side on account of adhesions between the gall-bladder and the pylorus. During these outbreaks of biliary colic the stomach itself may be distended. Its peristalsis is very liable to have been embarrassed by the disturbances going on in the gall-bladder. Here gastric lavage often gives, during biliary colic, more striking relief than does the hypodermatic use of morphine.—W. D. HAMILTON in *The Lancet-Clinic.*

American Journal of Surgery

PUBLISHED BY THE

SURGERY PUBLISHING CO.

J. MacDONALD, Jr., M.D., President and Treasurer

92 William St., N. Y., U. S. A.

to whom all communications intended for the Editor, original articles, books for review, exchanges, business letters and subscriptions should be addressed.

SUBSCRIPTION PRICE, ONE DOLLAR
FOREIGN, SIX SHILLINGS

Original Articles and Clinical Reports are solicited for publication with the understanding that they are contributed exclusively for this journal.

It is of advantage to submit typewritten manuscript; it avoids errors.

CHANGE OF ADDRESS. Subscribers changing their addresses should immediately notify us of their present and past locations. We cannot hold ourselves responsible for non-receipt of the Journal in such cases unless we are thus notified.

ILLUSTRATIONS. Half-tones, line etchings and other illustrations will be furnished by the publishers when photographs or drawings are supplied by the author.

☞SPECIAL NOTICE TO SUBSCRIBERS☜

The "American Journal of Surgery" is never sent to any subscriber except upon a definite written order. Present and prospective readers please note this.

WALTER M. BRICKNER, M.D., Editor

NEW YORK, JUNE, 1913.

THE COLLEGE OF SURGEONS.

Upon the invitation of an Organization Committee appointed by the Clinical Congress of Surgeons at its meeting in November, 1912, extended to five hundred prominent surgeons of the continent of North America, four hundred and fifty of these gathered last month just before the Congress of American Physicians and Surgeons in Washington, and there organized the American College of Surgeons.

The immediate purpose of the College is to admit to membership "without favor" all North American practitioners of general or special surgery of established ability and unquestioned moral character, to confer upon them the title of Fellow of the College of Surgeons, and to encourage their use of this title (F. C. S.) "on professional cards, in professional directories and in scientific articles published in surgical literature."

This in itself will not be preclusive of the right to practice surgery by any physician not an F. C. S., and to the extent that it will merely indicate to the profession and to the laity those who are recognized as experienced, such a plan, fairly and liberally pursued, will serve a useful purpose and deserves, it seems to us, to be commended.

But, we fear, the American College of Surgeons, even in its present tentative and somewhat nebulous form, seriously purposes to go much further than this. We quote from the "Call of the Meeting" the following paragraphs (italics ours):

"First, It should formulate a minimum standard of requirements which should be possessed by any authorized graduate in medicine, who is *allowed* to perform independently surgical operations in general surgery or any of its specialties."

"Third, It should seek the means of *legalizing* under national, colonial, state or provincial *laws*, a distinct degree supplementing the medical degree, which shall be conferred upon physicians possessing the requirements recognized by this law as *necessary* to be possessed by operating surgeons."

These paragraphs were adopted only in the form of the broad statement, "The object of the College shall be to elevate the standard of surgery * * *"; but this documentary evidence, the establishment of a standing committee on legislation, the provision for huge financial assets, and the personal statements to us of members of the established Board of Governors and Board of Regents, leave no doubt in our mind that the College of Surgeons does seriously and certainly, however vaguely, intend to seek laws establishing what constitutes surgery and who may and who may not be "allowed" to practice it.

This is a very serious matter, indeed. Even the contemplation of such a plan is pregnant with dissensions among the profession; and every effort to develop it will be beset with grave difficulties and with the very real danger of working hardships on capable practitioners and on the communities they serve. Even these vague expressions of the purposes of the College have caused some eligible surgeons to speak of it as an effort to form a "monopoly." The personnel of the founders and of the Board of Regents*, to whose management the College has been committed, is sufficient denial of any such unworthy purpose. Nevertheless the rank and file of general practitioners of medicine and surgery and of aspiring specialists (and very many of both of these classes do excellent surgical work) will bitterly resent any legislative disturbances that threaten to rob their licenses of the right to practice any branch of medicine to which their tastes, their talents and their opportunities may attract them, or the necessities of their environment may develop them.

We are in accord with the loftiest ideals of medicine, ethically and scientifically—with the "professional conscience" that includes both of these. But not five years, nor twenty-five years of training can make all licensees safe and conscientious internists or surgeons, and many a man with lesser apprenticeship is more reliable than his much-taught colleague. To open the hospitals of this country to under- and post-graduate study is a great need (the accomplishment of which will go far towards satisfying this agitation); and a regular supplementary course in surgery may yet prove a desirable rule.

* J. M. T. Finney, Maryland; A. J. Ochsner, Illinois; Franklin H. Martin, Illinois; George E. Brewer, New York; George E. Armstrong, Quebec; John B. Murphy, Illinois; Edward Martin, Pennsylvania; F. J. Cotton, Massachusetts; Herbert A. Bruce, Ontario; C. F. Stokes, Washington, D. C.; William D. Haggard, Tennessee; George W. Crile, Ohio; Robert E. McKechnie, British Columbia; Charles H. Mayo, Minnesota; Harry M. Sherman, California. President, J. M. T. Finney; First Vice-President, W. W. Chipman, Quebec; Second Vice-President, Rudolph Matas, Louisiana; Treasurer, A. J. Ochsner; General Secretary, Franklin H. Martin.

But for the present, no legislation, and certainly no other legislation, to restrict the practice of surgery should, we believe, be encouraged. We would not condemn any definite plan of the College of Surgeons before it is uttered, but we would urge the College to proceed in the consideration of legislative restrictions very cautiously, to make haste very slowly!

We shall discuss this subject more specifically in the subjoined editorial. It is, we have said, a very serious matter. It concerns those who are not eligible to the title of F. C. S. even more than those who are. Both should be heard, and we shall be pleased to give space to the publication of letters from either.

We cannot refrain from comment on another aspect of the organization of the College of Surgeons to which we have briefly alluded. The by-laws provide that "An initial fee of Twenty-five Dollars shall be required of each member of the College on his election to fellowship by the Board of Regents. The annual dues will be Five Dollars." Either the initial fees or the dues alone would, it seems to us, supply funds far in excess of the financial needs of such an organization. A membership of only five thousand (and there are many more than five thousand physicians in the United States and Canada eligible to fellowship) would provide at once a fund of $125,000 from initial fees, and an annual income of $25,000! Rent for headquarters, clerical expenses, certificates, printing and postage, the issuance of a directory and the cost of general and committee meetings, cannot, we should think, require more than a small part of these large sums. What is the need for all the rest of the money?

The mere matter of finances might seem too small to cavil at, but since we are interested in the College of Surgeons and approve its primary and immediate purpose, we should not like to see that purpose defeated by a perhaps unreasonable system of fees; and we have heard members of the American Surgical Association and of the American Gynecological Society (*eo ipso* fellows-elect of the College) say "they'd be hanged if they'd pay twenty-five dollars for a mere title." And if an initial fee of $25 is necessary, what is the purpose of the annual dues of $5? Surely the title would not be revoked in default of them! Apparently the annual tax merely continues an active membership that conveys no other privilege than that of voting once a year for the Board of Governors who are, in turn, to vote for the Board of Regents. W. M. B.

A BILL TO RESTRICT THE PRACTICE OF SURGERY.

In April there was introduced before the Legislature of the State of Illinois a bill to "regulate the practice of surgery" so vicious and so foolish that we cannot believe it will be passed. For aught we know it may have already been rejected or buried in committee, but since it represents a type of legislation that may be attempted elsewhere* it is important that its provisions should be made known to the profession generally and that its potentialities for evil should be discussed.

The bill provides that no physician "shall perform any surgical operation other than that of minor surgery in family practice, or emergency surgery" unless he has been licensed in surgery by the State Board of Health. To secure this license he must pass an examination before a Commission of licensed surgeons composed of one member nominated by the Governor of Illinois and one member nominated by "the president of each university in the State of Illinois having a medical department recognized by the State Board of Health as complying with the rules and regulations of said Board." (This excludes from representation in the Commission all duly chartered medical schools not affiliated with any university and those which are departments of universities not located in the State of Illinois.) The candidate for the right to practice surgery is not eligible to this examination unless since graduation he has "been engaged in the general practice of medicine for a period of at least five years; has had at least one and one-half years of experience as an interne in a general hospital or has been engaged in the study of surgery in a graduate school of an American university for a period of at least one and one-half years or has been engaged in the study of surgery in a university hospital or hospitals in foreign countries for a period of at least one and one-half years; and has been engaged for a period of three years as an assistant to a surgeon duly recognized as properly qualified by the State Board of Health of Illinois. The periods herein specified for surgical preparation need not be additional to the period herein specified for the general practice of medicine."

Our objections to this bill are specific and general. We shall consider the former first, and briefly. The bill is bad in that it does not define "minor surgery" or "family practice." The bill would probably be equally bad if it attempted to define these vague terms. Is a transient patient a part of "family practice"? Is tonsillectomy "minor surgery"? Is thoracotomy for empyema? Is drainage of a lung abscess? Carbuncle is a major and often a fatal surgical lesion; is its incision major or minor surgery? What appears at the outset to be a minor operation often proves to be major. The apparently simple removal of a superficial diseased cervical lymph node sometimes develops, of necessity, into an extensive dissection of the neck. The removal of a small tumor supposedly in the abdominal or thoracic wall may lead the operator into the cavity itself. An apparently small lipoma sometimes proves to be an extensive arborescent tumor. If such a bill as this became a law a physician, unlicensed in surgery, who, undertaking in good faith a minor operation, found himself confronted with a major procedure, would have no recourse to law for the collection of his fee and, far worse, he would be in danger of a heavy fine or commitment to jail! If this bill were passed no practitioner in a small town, unlicensed in surgery, could perform a major

* There is also, we believe, a bill to regulate the practice of surgery before the New Jersey Legislature.

operation, no matter how fit to do so he might be, if there were in that town a single licensed surgeon, no matter how unfit he might be. The unlicensed man would have to call upon the licensed colleague to perform versions and high forceps operations (certainly major surgery) although the first man might be skilled in obstetrics and the second one might know very little of it!

It is, indeed, desirable that specialists in surgery or in any other branch of medicine should have experience in "general practice," and most of them have had; but to provide that no man shall have the right to practice a surgical specialty, no matter what his skill, unless he has first devoted five years to general practice, is arbitrary, unreasonable, even "confiscatory" of possible opportunities. Equally unreasonable is the demand for three years' apprenticeship as an assistant to a licensed surgeon. Such assistantships are not generally available, and the effect of this provision would be to concentrate surgery in the large cities (which, perhaps, is its purpose).

The most amazing part of this astonishing bill is the exemption from its hardships afforded to a surgeon "who has passed an examination before the U. S. Army, the U. S. Navy or the U. S. Public Health and Marine Hospital Service." We fail to see why a bill requiring such rigorous conditions of civilian practitioners should waive them all for the benefit of men who have merely passed an examination before the Army, Navy or Public Health Service, irrespective of the length of time since their graduation and of the limitation of their surgical experience! Of course, this exemption applies also to the Medical Reserve Corps of the Army, about fourteen hundred in number, of whom many were appointed without any but a perfunctory examination, and of whom several are internists, pathologists, or specialists who never handled a scalpel! This exemption would make it possible for some men unwilling or unable to pass the Commission's examination and to serve the long years of hospital interneship, general practice and surgeon's assistantship, to acquire a license in surgery by merely securing an appointment in the Medical Reserve Corps! The author or authors of this bill must have known this. The provision is a "joker"!

The general objections to this bill are more serious and concern the profession at large. It is, of course, true that much mischief is done by surgical operations at the hands of incompetent men. But in the aggregate there are more mistakes and bad results to be credited to experienced surgeons (those who could establish title to a license under this bill) than to occasional operators, whose opportunities are fewer. One sees many more instances of clumsy and incompetent midwifery than of bad surgery. Why not, then, frame a bill providing that no physician shall conduct an obstetric case until he has spent one and one-half years as a hospital interne, five years in general practice and three years as an assistant to a licensed obstetrician, and has passed a Commission's examination! Moreover, a licensed surgeon experienced in gynecology would probably make a sorrier mess of a prostatectomy than an unlicensed practitioner who is experienced in that work, and a duly licensed surgeon trained in orthopedics cannot, therefore, be trusted with a hysterectomy or the removal of a brain tumor. If legislatures want to make sure that practitioners shall not be permitted to have their consciences decide what they are able to do, the human body must be legally divided into small sections, licenses for the special surgery of each to be awarded after examination by individual commissions!

More fatalities result from faulty and tardy diagnoses by physicians who never attempt surgery than from operations performed by the unfit. The effort to correct the evils that arise from incompetence, by restricting the practice of surgical specialties, overlooks the fundamental fault and attacks the problem at the wrong end. What is needed, rather, is to maintain for all practitioners the proper standard of medical education and moral fitness. Beyond that provision by the states, *no matter how laws may be multiplied, the sick must rely upon the individual good sense and conscience of their physicians*—and these are qualities which legislators are not always able to supply.

Far wiser than any such proposed regulation as that of the Illinois bill would be laws regulating admissions to medical schools on the bases of preliminary education and moral fitness, and providing for *adequate* bedside instruction. Let the states insist that *all licensed hospitals conducting free treatment—and especially those receiving state or municipal support, shall be open to undergraduate and post-graduate students,* that they may be freely taught their art by its masters. *This is the true Hippocratic spirit*—which we fear has been sadly departed from by many of those who are "up" in their attitude towards those who also wish to climb.

W. M. B.

THE EXPLOSION OF THE TUBERCULOSIS CURE.

In an editorial in our February issue discussing the report by Dr. F. F. Friedmann of Berlin of his discovery of a cure for surgical and pulmonary tuberculosis, we assumed for that investigator a scientific accuracy and sincerity which his recent conduct in this country quite demonstrates that he does not possess. It is now clear that, largely discredited in Berlin, he hastened to exploit this country by commercializing his method here before its weaknesses might be definitely established.

Whatever therapeutic value the Friedmann vaccine may yet be shown to have (and thus far it has not been proven to have any), it is evident to those who have watched patients submitted to it, that it is not a cure, as it was proclaimed to be, and is very far indeed from being a specific.

About two months after the first injections in New York and at a time when Friedmann must have known that adverse reports were impending, he concluded a commercial contract which secured to him an immediate large payment of cash and

prospects of still larger profits from the various Friedmann institutes that will flourish for a time. That he has always replied evasively to questions bearing on the preparation of his vaccine, the selection of his doses and the determination of the intervals of injections, that he has insisted that the profession generally could not be trusted to use his vaccine, that he has arranged for its employment only in Friedmann institutes, are methods that have earned for others the quality of quackery.

It is altogether deplorable: that a much-proclaimed cure of a great scourge should have proven to be merely a sordid exploitation; that Friedmann's vulgar quarrels with his associates should have smirched the name of professional zeal; that the diminishing pocket-books of the despairing sick are to be invited to purchase a treatment the value of which has never been established; that medical men of clean record are willing to jeopardize the esteem of their colleagues by conducting such an unproven and more or less secret treatment; that, especially, the long-hoped-for specific for tuberculosis is still to be sought; and that, when it is discovered, the Friedmann experience will add fresh skepticism to its reception. W. M. B.

THE AMERICAN MEDICAL EDITORS' ASSOCIATION.

The annual meeting of the American Medical Editors' Association will take place on June 16th at the Hotel Radisson, Minneapolis. The annual banquet will be held in the evening at the same hotel. An interesting programme has been prepared for both these sessions.

The Committee on Fractures of the American Surgical Association desires to have two reprints of any paper dealing with the non-operative or operative treatment of open or compound fractures which has been published within the last five years.

The Committee also desires papers on the medico-legal relations of radiography to the diagnosis and treatment of fractures.

If authors on these subjects have no reprints, the Committee would be pleased to receive memoranda of the places of publication of such papers.

JOHN B. ROBERTS,
Chairman Committee on Fractures,
313 S. 17th Street, Philadelphia.

Bear in mind that pain about the tendo Achillis may be a sign of gout or over-exertion, and also that there is a bursa between the tendon and the os calcis.

If the tendo Achillis be torn from the point of insertion, operate; but if the tendon rupture in its continuity, good function may follow fixation with the knee flexed and the ankle extended (plantar flexion). Do not permit use of the tendon for eight weeks.—Bernays' Golden Rules of Surgery.

Surgical Suggestions

The perineal route is to be preferred for the removal of the cancerous prostate.

Renal calculi occasionally cause constant dull pain without any "attacks."

The lining membrane of a maxillary bone cyst is usually easily removable complete with forceps.

Midline sinuses or swellings are always suggestive of dermoid cysts.

A suppurating perineal dermoid cyst may discharge through the scrotum or at the peno-scrotal angle, suggesting a peri-urethral abscess.

Beck's bismuth paste will sometimes cure a persistent narrow empyema sinus; but it cannot cure a persistent empyema cavity, and in such cases it is very apt to cause serious or fatal bismuth poisoning.

When bismuth paste is used in any considerable quantity (an ounce or more) for x-ray diagnosis it should be promptly washed out of the wound with olive oil, to avoid poisoning.

Tuberculin continues to hold a valuable place as a means of diagnosis in surgical tuberculosis. Pain and tenderness at the site of the lesion after an injection of tuberculin points strongly towards tuberculosis. The dose should be small (1-10th milligramme O. T.) or large (½ milligramme), according as the reaction to a preliminary von Pirquet test is marked or absent.

An abdominal drainage tube that is in contact with the epigastric vessels occasionally erodes them and causes alarming hemorrhage. When such a vessel is at the edge of a wound through which a tube is to be passed, it is a wise precaution to ligate it above and below.

Not all fistulae in the anal region are of rectal origin. Just as the midline sinus of the coccygeal region is congenital and is either blind or leads to a sacro-coccygeal dermoid cyst, so too a fistula opening in front of the anus and extending to the midline, proceeds from a perineal dermoid or the remains of one.

Surgical Sociology

Dr. Ira S. Wile, Department Editor.

In the extension of hospital facilities throughout the country, there is great need of increasing the number of general hospitals. The principle of efficiency should be recognized in the establishment of future hospitals and dispensaries. The isolated dispensary devoted to the treatment of a single class of disease is as a rule incapable of accomplishing in the most successful manner the very work for which it is designed. The very complexity of medical and surgical conditions, involving as they do various portions of the body, indicates the necessity of having hospitals equipped for the thorough investigation of all aspects of the patient's diseases. The increase of special hospitals may possess, in theory, some basis for support; practically, the general hospital is more necessary.

From the standpoint of medical and surgical efficiency, from the standpoint of social usefulness, and in the interests of economy of the time and money of the patients making use of the dispensaries, there is every reason for extending general hospitals. The tendency to urge the creation of more special hospitals and dispensaries should be discountenanced. It should be a rational part of a broad municipal policy to encourage the establishment of the necesary number of large general hospitals including all the special departments. This would serve to place hospital organization and distribution upon a business-like, as well as upon a sound scientific basis.

For the emergency treatment of surgical conditions it may be urged that special dispensaries are needed because ambulance services are not maintained by all general hospitals. There is no reason, however, why the large general hospitals to which the city grants relief from taxation should not assume responsibiilty for the care of those requiring transportation to hospitals. The maintenance of an ambulance service within a definite district should be included in all hospital plans. It would be possible also for each general hospital to maintain within its ambulance district one or more emergency stations with a few beds, at which first aid might be administered, minor accidents dressed, and emergency treatment given. Such emergency stations would then serve as screens to sift out those patients who could be sent to their homes or should be transported to a hospital for care in the wards or private rooms.

Hospital and dispensary administration requires more cooperation of the different hospital organizations with a view to working out the hospital needs of the city in which they are located. A movement of this kind is represented by the Associated Out-Patients Clinics of New York City, which represents a cooperative union of the numercus dispensaries for the sake of bettering dispensary facilities in the city and protecting the various clinics from overlapping of work and from imposition by patients.

If it were possible to harmonize all the special hospitals and annex them to various general hospitals by some administrative tie, there would undoubtedly be a tremendous gain for the community. One of the difficulties tending to postpone such harmony of action is the limitation of the number of attending physicians and chiefs of clinics who are permitted to have authority under general hospital organization. To entirely abandon the special hospitals might create a monopoly for the practice of the specialties in the hands of attending physicians and chiefs of clinics. This would serve to create greater professional jealousies and would lead to many unpleasant complications in the professional world. The solution of the special hospital or dispensary problem, however, requires careful consideration, as it is obvious that progress demands further administrative centralization with a greater opportunity for the scientific investigation of diseases. This is not possible as the special hospitals are at present constituted. Despite the exceptional hospitals where laboratory facilities are afforded, the special hospitals may be characterized as lacking the equipment which is so necessary for scientific thoroughness.

The institution of the future is the general hospital, possessing facilities caring for all the specialties, administering alike to the poor and to the great middle class which at present is forced into the wards or compelled to make untold sacrifices to secure the hospital care they need. The general hospital of the future must be directed in the interests of the self-respecting wage-earner who asks no charity and dislikes to have it thrust upon him.

In connection with the general opposition to osteopathy, there was considerable dissatisfaction when the Regents of the State of New York admitted followers of Still to examination under their auspices. By the laws of 1907 the practice of osteopathy was recognized as a branch of medicine in New York State. The state law does not involve registration with local boards of health, consequently the New York Department of Health, whose Sanitary Code required physicians to register, refused to acknowledge osteopaths as practitioners of medicine.

In 1909 a sub-section of the New York City Sanitary Code was amended so that no permit for the burial or transportation of a corpse would be permitted without a certificate of death "signed by a physician upon whom has been conferred the degree of doctor of medicine." The legality of this action which prevented osteopaths from signing death certificates was attacked. The position was sustained through the courts, including the Court of Appeals.

In May, 1913, the Board of Health took a more liberal view of the state law and amended the Sanitary Code so that the death certificate could be signed "by a physician who has been granted a license after a medical examination, conducted by

the New York State Board of Medical Examiners, the questions for which have been prepared by the Board of Regents of said state." This enactment recognizes the few osteopaths who have fulfilled the requirements of the State Board of Regents. The large number of osteopaths, however, who were permitted to practice under a special provision in favor of osteopaths actively engaged in practice on May 13, 1907, were not included among those permitted to sign death certificates.

It is of course desirable to have harmony between state laws and local laws, but it is fortunate that the Sanitary Code enables the local boards of health to protect the community from the effect of pernicious legislation which is at times secured through lobbying or special interests.

This recent action by the New York City Board of Health tends to establish osteopaths on a stronger basis, though fortunately some protection is afforded through the limitation of the type of osteopaths whose diagnosis is regarded as acceptable to the Department of Health.

The difficulties in securing accurate vital statistics involve the necessity of having death certificates filled out by persons capable of making correct diagnosis. Any cult which has for its basis such a limited pathology as is indicated by the basic principles of osteopathy lacks facility for correct diagnosis. There is a great problem connected with this recent action, insofar as it may invalidate some of the death certificates as far as mortality statistics are concerned.

Book Reviews

Practice and Problem in Abdominal Surgery. By A. Ernest Maylard, B.S. (Lond.), Surgeon to the Victoria Infirmary, Glasgow. Octavo; 388 pages; 39 illustrations. Philadelphia: P. Blakiston's Son & Co., 1913. *Price*: $3.25, net.

As the author states in the preface, his book is not intended to be a treatise on the subject of abdominal surgery. "Many of the commoner operations are merely mentioned, without any description of their mode of execution." Maylard has presented, in an interesting manner, an extensive experience in the practice and with the problems of abdominal surgery. Much of what is presented appeals strongly as sound common sense. Exception must be taken, however, to a number of statements the author makes. For example, a chapter is devoted to the subject of abdominal pain. Maylard states that "the clinical significance of pain so evoked (by careful pressure of the examiner's hand) is that it renders practically certain the existence of mischief at the particular spot where the pressure produces the pain." If this were so, a large majority of the difficult problems in abdominal diagnosis would not exist.

Maylard warmly advocates transverse abdominal incisions but does not prove their advantage to our satisfaction. He surely does not offer any convincing argument for his routine procedure of keeping patients in bed for many weeks after ordinary abdominal operations.

Whatever criticism be directed against Maylard's book, however, is more than balanced by the many valuable practical suggestions and ideas it contains. It is interesting and very useful reading for all concerned with the problems arising in abdominal surgery.

Précis de Pathologie Chirurgicale. Vol. IV. The Genito-Urinary Tract; Fractures and Dislocations; Diseases of the Extremities. By P. Begouin, Professor in the Faculty at Bordeaux; E. Jeanbrau, R. Proust, L. Tixier, Professors in the Faculties of Montpelier, Paris and Lyons. Octavo; 1305 pages; *429 illustrations.* Paris: Masson and Company, 1913. *Price* $2.00.

This is the last volume of the text-book of surgical pathology. The very favorable impression gained upon perusal of Volume III continues upon examination of the last of the series. Nine surgeons of the younger school have combined to produce this work and much evidence of that school is to be found in the progressive viewpoint held throughout.

The first half of Volume IV is devoted to the pathology of the genito-urinary system and is entirely written by Jeanbrau. In the reviewer's opinion it is the best part of this excellent volume, most thoroughly and clearly and at the same time succinctly presenting the subject. Several important topics are too briefly described in the other parts of the book.

A bibliography would surely make this text-book more valuable. Much of the sketchily described therapy appears entirely out of place. Nevertheless, this text-book of gross surgical pathology is one of exceptional merit and will prove very valuable to those deeply interested in the subject.

Les Épanchments du Péricarde. Etude Clinique et Thérapeutique. La Ponction Epigastrique de Marfan. (*Pericardial Effusions, a Clinical and Therapeutic Study.*) *The Epigastric Puncture of Marfan.*) By Germain Blechmann, former Interne in the Hospitals of Paris. Octavo; 350 pages; profusely illustrated. Paris: J. B. Ballière et Fils, 1913.

This monograph, from Professor Marfan's service, is a most painstaking, thorough, and able presentation of the etiology, physical signs and symptoms, and the treatment of pericardial effusions. The subject is largely treated from the viewpoint of the internist, but the discussion will nevertheless prove of great value to all interested in a subject on the borderline between surgery and medicine.

Unlike many graduate theses we have seen, this one is free from bombast and from unsupported assertions. The last 90 pages of Blechmann's work are devoted to an exceedingly careful, analytical study of material of his own and of others, in which he amply proves many of the statements made in the main part of the work. The bibliography at the end of the book appears very complete.

To the readers of a surgical journal, that part of the thesis dealing with treatment is perhaps of most interest. That pericardial effusions are proven by Blechmann to accumulate principally below and to the right and the left of the heart, but not in front of that organ, is of importance in diagnosis and in therapy. Pleural punctures and punctures of the heart itself have been altogether too frequent because this fact has been neglected. Therefore Marfan's substernal or epigastric puncture of the pericardium is most strongly advocated as the most rational, most simple and most certain method of tapping an effusion. In an analogous manner, Blechmann argues in favor of substernal pericardiotomy when drainage is indicated.

It is impossible to do justice to a book of this type in a brief review. However, enough has been said to indicate that Blechmann's monograph should be of lasting value to a large circle of readers and will, perhaps, prove to be a standard work in the course of a few years.

Die Localanaesthesie. *Ihre Wissenschaftlichen Grundlagen und Praktische Anwendung.* (*Local Anesthesia, Its Scientific Basis and Practical Application.*) By Professor Dr. Heinrich Braun, Director of the Koeniglichen Krankenstift in Zurickan. *Third, Completely Revised Edition.* Octavo; 486 pages; 207 illustrations. Price: 15 marks. Leipsig: Johann Ambrosius Barth, 1913.

A new edition of Braun's standard work on local anesthesia will be gladly welcomed, for the last edition ap-

peared almost seven years ago and many advances have been made since that time. It is the best book we know of on the subject, written by one to whom perhaps more is due for the advancement of local anesthesia than to any other surgeon. The subject is dealt with in a most comprehensive way, historically, scientifically and practically. Any information one may require concerning local anesthesia (excepting spinal and sacral anesthesia) in general surgery or in any of the specialties is to be found in Braun's monograph. The book is well illustrated and clearly written. There is a very complete literature at the close.

The Catarrhal and Suppurative Diseases of the Accessory Sinuses of the Nose. By ROSS HALL SKILLERN, M.D., Professor of Laryngology, of the Medico-Chirurgical College; Laryngologist to the Rush Hospital; Fellow of the American Laryngological, Rhinological and Otological Society; Fellow of the New York Academy of Medicine; Member of the Society of German Laryngologists, etc., etc. Octavo; 389 pages; 247 illustrations and six colored plates. Philadelphia and London: J. B. LIPPINCOTT Co., 1913. Cloth, $5 net.

The study of the diseases of the nasal sinuses has advanced to such an extent within the last decade that a special book on this subject in English is more than welcome. Some five or six works in French and German are especially commendable, but only one, that of Logan Turner, has appeared in English.

The author has attempted to set forth a thorough and exclusive work on this subject which can be used by the specialist in the study of these diseases. The volume is particularly well illustrated, and we believe is even superior to the treatises of Hajek and Luc, which latter volumes are made up mainly of illustrations with very little reading matter.

The first ninety-eight pages deal mainly with the general consideration of sinus disease, the text of which is interspersed with an excellent bibliography. Part II takes up the special sinuses, the maxillary, the frontal, the ethmoid labrynth and the sphenoid. Not only is consideration given to operative technic, but there is a great deal of valuable information on the conservative and medical treatment of sinus diseases. Although for the main part the volume deals with treatment, consideration is also given to special diagnosis and symptomatology.

We congratulate the author on the thoroughness of his work. The science of rhinolaryngology, particularly, needs the addition of monographs on various diseases of the nose and throat, which can be used by the specialist, instead of the numerous mediocre text-books which are supposed to be used by the general practitioner.

Vaccine Therapy; Its theory and practice. By R. W. ALLEN, M.D., B.S. (Lond.); late Clinical Pathologist to the Mount Vernon Hospital for Diseases of the Chest; late Pathologist to the Royal Eye Hospital, etc. *Fourth edition.* Duodecimo; 444 pages. Philadelphia: P. BLAKISTON'S SON & Co., 1913.

Much of the glamor attending the introduction of vaccine therapy by Wright and his followers has been dimmed in the past few years; the indications for the use of vaccines have become more definite and in consequence greatly narrowed. In England, probably on patriotic grounds, vaccines are still employed far more extensively than in other countries, but even here there are indications that much of the early enthusiasm is waning.

The work before us represents extreme views. The author believes that vaccines will cure most anything, including such widely different diseases as diabetes, appendicitis, abscess and gangrene of the lung, psoriasis, asthma, pernicious anemia and dysentery. He even believes that oral administration of vaccines is of benefit. It is a relief, however, to note that even the author has gone back on the opsonic index as a guide to treatment. It seems to us that this leaves Wright himself as the last advocate of this greatly harrassed proceeding.

Despite these extreme views, the work affords an excellent outline of the theory and general practice of vaccine therapy.

A Manual of Immunity For students and practitioners. By ELIZABETH T. FRASER, M.D. (Glas.), late Assistant Bacteriologist, Glasgow Royal Infirmary; Beit Research Fellow. Duodecimo; 199 pages. Glasgow: JAMES MACLEHOSE AND SONS, 1912.

This modest little manual affords a concise summary of the various phases of immunity. The theory of the subject is lucidly set forth. The technique and practice of serum and vaccine therapy are concisely stated and the author's views are set forth with a wholesome conservatism. The various immunity reactions, such as those of Widal and Wassermann, and the precipitin tests, the various tuberculin reactions, opsonic estimations and the meiostagmin reactions are succinctly described and their limitations are estimated with judgment. The predominant characteristics of this little work is its engaging brevity.

Progressive Medicine: A quarterly digest of advances, discoveries and improvements in the medical and surgical sciences. By HOBART AMORY HARE, Professor of Therapeutics and Materia Medica in the Jefferson Medical College, Philadelphia; assisted by LEIGHTON F. APPLEMAN, Instructor in Therapeutics, Jefferson Medical College, in Philadelphia. Philadelphia and New York: LEA AND FEBIGER, March 1, 1913.

This volume contains five reviews: Surgery of the Head, Neck and Thorax, by Chas. H. Frazier; Infectious Diseases, including Acute Rheumatism, Croupous Pneumonia and Influenza, by John Rühräh; Diseases of Children, by Floyd M. Crandall; Rhinology and Laryngology, by George B. Wood; and Otology, by Arthur B. Duel. All the essays are ably written and little or nothing in the recent advances of their respective topics has escaped attention.

Bovine Tuberculosis and its control. By VERANUS ALVA MOORE, B.S., M.D., V.M.D., Professor of Comparative Pathology, Bacteriology and Meat Inspection, New York State Veterinary College at Cornell University, and Director of the College. Octavo; 134 pages; 36 full-page illustrations. Ithaca, N. Y.: CARPENTER AND Co., 1913.

The work deals with the cause, pathology, symptoms, methods of dissemination, diagnosis (including tuberculin and its use), immunization and methods of control of bovine tuberculosis. A list of references is appended, all of which, we are surprised to note, are American. The illustrations are half-tones of the principal lesions of bovine tuberculosis and are exceptionally well executed. To those interested in meat inspection this book should prove a mine of information.

Pathfinders in Medicine. By VICTOR ROBINSON. With a letter from Ernest Haeckel and an introduction by Abraham Jacobi. Octavo; 317 pages. *New York Medical Review of Reviews,* 1912.

This work constitutes a series of biographical essays. While by no means the fifteen most representative pathfinders in medicine have been chosen, the author's selections are fairly eclectic. These include Galen, Aretæus, Paracelcus, Servetus, Vesalius, Paré, Scheele, Cavendish, Hunter, Jenner, Lænnec, Simpson, Semmelweis, Schleiden and Schwann, and Darwin.

The manner of narration is certainly novel. In attempting to escape from the conventional matter-of-fact style of biography, Robinson has called upon many of the arts of the modern short story.

Thus characters are sketched, a tone of "atmosphere" prevails, "action" is a prominent feature, and to secure additional vividness imaginary conversations, some in poor taste, are introduced. Interspersed are copious animadversions; and the whole is tinged with a curious smart worldliness that reminds us strongly of Kipling's early style. There is also an abundance of fine writing, most of which falls flat from the weight of its own imagery.

The essays are probably not intended for anything more than occasional reading. As such we recommend them.

Medical and Surgical Report of the Presbyterian Hospital in the City of New York, Vol. IX., July, 1912. Edited by JOHN S. THACHER, M.D., and GEORGE WOOLSEY, M.D. Octavo; 622 pages; illustrated.

This volume of 622 pages represents the work done by the various members of the hospital staff in the year ending July, 1912. All the articles written have been published elsewhere, except one by DuBois on the "Absorption of Food in Typhoid Fever," which had won the Bridon medal (awards open to alumni of the Presbyterian Hospital). The volume is an interesting index of the excellent work done in one of the great hospitals in New York City.

The International Medical Annual; A Year Book of Treatment and Practitioners' Index, 1913. Octavo; 628 pages; illustrated. New York: E. B. TREAT AND COMPANY. Price $3.50.

This medical annual is now in its thirty-first year. It represents an epitome of the progress, especially in therapy and diagnosis, made by medicine in the year 1912. The first section of about fifty pages deals with therapy and consists of an alphabetically arranged list of remedies and their uses. The second part, embracing about 500 pages, consists of a similarly arranged list of abstracts concerning diseases and subjects of medical interest. Each article is followed by a number of references giving the exact location of the various journals and papers abstracted.

The abstracts are splendidly edited and are not only useful as references, but make very interesting reading matter. Not the least of the excellent features of the book are the illustrations which have been splendidly executed, especially the radiograms.

The annual can be highly recommended as a very readable and useful résumé of recent medical progress.

Foods: Nutrition and Digestion. By SUSANNA COCROFT. *Second edition.* Physical Culture Extension Society, 1912.

This little book is designed to give the layman a survey of rational ideas as regards diet. It contains a brief description of the physiology of digestion and nutrition, put in such a manner as to be comprehensible to the lay mind. The various classes of foods, their caloric value and the various methods of preparation are discussed. Stress is laid on careful preparation of food, on the importance of properly masticating, and on sensible amounts of exercise in order that the food eaten may be properly assimilated. For the housewife who as a rule knows extremely little about food values, this book will make excellent reading.

Health and Longevity Through Rational Diet. By DR. ARNOLD LORAND, Carlsbad. Octavo; 416 pages. Philadelphia: F. A. DAVIS COMPANY, 1912. $2.50.

The subject of dietetics is one which should interest every medical man, whatever his specialty may be, and therefore a book on this subject should be written in a form in which it will be of use to a number of different types of physicians. In the book here under consideration, Lorand's "Health and Longevity Through Rational Diet," the subject is presented in a very attractive manner. The introductory chapters deal with the general consideration of nutrition, food values and appetite, and the influence of foods on man. The effect, whether good or evil, of various kinds of food, is then taken up in detail, each variety of food receiving a special discussion; this forming the largest part of the volume.

The style is very entertaining, numerous interesting bits of information being interpolated. Although the references are to articles and writers of the highest authority, the general character of the book is such that it may be enjoyed by the lay reader. For this purpose a glossary containing definitions of the medical or technical words used is appended.

Progress in Surgery

A Résumé of Recent Literature.

Contribution to the Etiology of Gastric Ulcer: I. The Resistance of Living Tissues to Digestion. (*Beitrag zur Entstehung des Magengeschwuers: 1. Neber die Widerstandsfaehigkeit lebenden Gewebes gegen die Verdauung*). M. KATZENSTEIN. *Archiv fuer Klinische Chirurgie,* Vol. 100, Part IV.

In this, the first of two papers on the etiology of gastric ulcer, the author sets forth his previous and present experimental data. He first demonstrates that living, well-nourished tissue are digested if placed into a stomach. In parallel experimental work Katzenstein shows that the tissues producing or constantly bathed by gastric juice are resistant to digestion, and that tissues not so bathed are not resistant. Thus, in one experiment, a loop of ileum was sutured into an opening of the stomach and a portion of the wall was promptly digested with resultant perforation of the loop of intestine into the stomach. On the other hand, when a portion of the duodenum was sutured into an opening of the stomach, this did not occur. An interesting experiment (oft repeated) was one in which a loop of stomach; a loop of duodenum, and a loop of lower intestine were simultaneously sutured into gastric openings. Almost invariably the loop of lower intestine was digested, whereas duodenal and gastric loops remained intact.

Furthermore, Katzenstein demonstrated that the gastric juice is the only factor that plays a rôle in these experiments. He inhibited the flow of gastric juice (by the administration of atropine) most effectually in a number of experiments and found that implanted loops of intestine were not digested under these circumstances.

Diverticulitis. JOSEPH STANTON, Boston. *Boston Medical and Surgical Journal,* March 6, 1913.

Stanton reports four cases of "diverticulitis" of the sigmoid, in one case associated with carcinoma arising within a diverticulum. He also reports one case of recurrent bowel obstruction due to a Meckel diverticulum which was cured by operation. He summarizes the clinical and therapeutic aspects of sigmoid diverticulitis and offers the following conclusions:

1. This is not a rare disease.
2. Recurrent attacks of left-sided abdominal pain, with tenderness and tumor formation, in the absence of any active urinary disturbance, are usually due to inflamed diverticula.
3. As a focus of chronic irritation it may be a starting point of cancer of the sigmoid.
4. Surgical removal is the only perfect cure.

Surgery of the Spleen. WILLIAM J. MAYO. *Surgery, Gynecology and Obstetrics,* March, 1913.

The Mayos have done twenty-seven splenectomies. The clinical diagnosis was splenic anemia eighteen times, wandering spleen twice, tuberculosis once, pernicious anemia and cirrhosis of the liver each once, and infectious splenomegaly four times. There were two deaths. The best results were obtained in the cases of splenic anemia of the Banti type.

For the removal of a large spleen an incision is made in the outer margin of the left rectus muscle extending from the costal arch downward until there is a space sufficient for manipulation. Adhesions are separated by sweeping the hand over the spleen under the diaphragm. The fundus of the stomach and the colon are drawn out of the wound with the spleen. The attachments together with the lienophrenic ligament can be divided under inspection. A rubber-covered elastic clamp of the lower variety is placed on the pedicle, if possible about three inches from the spleen.

Some Acute Abdominal Pains Which Do Not Require Operation. FREDERICK TAYLOR. Reprinted from the *Universal Medical Record* in *The Canadian Practitioner and Review.* March, 1913.

This article discusses various conditions which may confuse the diagnostician and which may lead to mistaken diagnoses in cases of acute abdominal pains. The conditions referred to, which simulate acute surgical conditions in the abdomen, are (1) Thoracic disease with referred pain, such as labor pneumonia or an acute pneumothorax; (2) Gastric crises of locomotor ataxia; (3) Diabetic coma; (4) Henoch's purpura; (5) Mesenteric embolism; (6) Angina abdominis.

Taylor refers to a number of cases of diabetes in which coma was preceded by continued vomiting and severe abdominal pains. Such cases can only be diagnosed correctly by the finding of glycosuria and acetonuria. Henoch's purpura may be very misleading since in this disease there are real abdominal lesions in the form of hemorrhages and exudation into the lumen and walls of the intestine. Under the name of angina abdominis are included cases to which Lauder Brunton first called attention in which very severe cramp-like abdominal pains are supposed to be due to spasm of the abdominal vessels similar to angina pectoris in the coronary vessels.

The Influence of Gastro-Enterostomy on Gastric and Duodenal Ulcers. A. A. BERG, New York. *Journal of the American Medical Association,* March 22, 1913.

Berg rejects the view largely held that gastro-enterostomy is essentially a drainage operation aiding the emptying of the stomach and thus relieving it. The good effects of the operation in gastric ulcer are produced, he says, only when there is an attendant pyloric spasm. Without this all the gastric contents continue to pass through the patent pylorus even after gastro-enterostomy and the ulcer is not protected from trauma or irritation. There is, besides, a strong tendency for the new opening to close up. If the ulcer is situated elsewhere than near the pylorus or in the upper duodenum, gastro-enterostomy has no effect on it. The reflux of the alkaline duodenal contents which usually takes place after gastro-enterostomy has a favorable tendency in neutralizing the hyperacidity and thus may aid in healing ulcers in other parts of the stomach as well as those near the pylorus. The freer discharge of pathological bacteria from the stomach is another possible good result of the operation. Gastro-enterostomy does not prevent recurrence of ulceration, nor does excision, barring the question of malignancy. Pylorostomy, Berg says, does protect against recurrence, but its mortality is higher. He favors the operation of occlusion of the pylorus by ligature or sutures together with gastro-enterostomy as equally effective against recurrence and attended with a much smaller mortality.

Carcinoma of the Stomach: An Analysis of 200 Cases of the Disease. JAMES LANGWILL, Edinburgh. *Edinburgh Medical Journal,* March, 1913.

Among the conclusions which the author arrives at, in a critical study of a large number of cases, are the following: Females are more frequently affected than textbooks would lead one to imagine. Many cases occur before middle age. All cases of gastric ulcer, healed or unhealed, are potential carcinomata. Systematic weighing in all gastric cases should be more commonly practiced, carcinoma being marked by a steady decrease in bodyweight. Constipation is a marked feature in practically every case of carcinoma of the stomach. Anorexia coming on in a person over 45 years of age previously healthy, is a symptom of great importance. Pain is an almost invariable early symptom. Scientific tests (gastric analysis, stool examinations, etc.) should be more generally resorted to and should be applied early since cases in the past have been referred to the surgeon much too late, a fact clearly brought out by the relatively small number of cases in which a radical operation was possible.

Direct Pennant Drainage of Chronic Ascitis into the Blood Stream via the Saphenous Vein. (*Die Directe Dauerdrainage des Chronischen Ascites durch die Vena Saphena in die Blutbahn*). DR. DOBBERTIN, Berlin. *Archiv für Klinische Chirurgie,* Vol. 100, Part IV.

Although no cases are described and results are not mentioned, the author details the technique he has evolved. The principle of the operation is the direct connection between the venous system and the peritoneal cavity. Dobbertin exposes a good length of the upper end of the internal saphenous vein. The peritoneal cavity is then opened through a small incision near Poupart's ligament. The skin between the peritoneal opening and the saphenous ring is tunneled and the vein (divided at the lower end of its exposure) is drawn through. End-to-end suture between the vein and parietal peritoneum (plus transversalis fascia, if necessary) is then performed, and the wounds are closed. Dobbertin does this operation under local anesthesia.

The Urachus as a Factor in Intestinal Obstruction; with report of a case. C. T. NICHOLSON, St. Louis. *Lancet-Clinic,* March 15, 1913.

The patient gave a history of repeated attacks of pain in the abdomen which were relieved by castor oil. Two days previously a similar attack occurred which, however, was not relieved. Symptoms of intestinal obstruction ensued. At operation a loop or ileum was found constricted by a cord which extended from the summit of the bladder to the umbilicus. This was ligated and divided and the patient made a smooth recovery. Nicholson shows by embryological data how a urachus, which is normally an extraperitoneal organ and associated with a mesentery, may become intraperitoneal and free.

Abderhalden's Serodiagnosis of Pregnancy and Its Practical Application. HENRY SCHWARZ, St. Louis. *Interstate Medical Journal,* March, 1913.

This article gives a very excellent brief explanation of the recently elaborated sero diagnostic test of pregnancy. The test depends on the fact that if small amounts of complex proteids be introduced into the blood stream, the body gradually develops ferments which are able to break down this particular proteid into simpler molecules. As applied to pregnancy, this means that the bits of syncytial cells which are being discharged into the maternal circulation gradually stimulate the formation of an enzyme in the maternal serum which is able to break down placental proteid. The reaction of abderhalden consists in mixing placental albumen with the serum to be tested and allowing the mixture to remain in a dialyzer in the incubator. If the ferment is present, peptone is produced and passes out of the dialyzer, and is tested for in the solution by means of a color reaction with ninhydrin.

Schwarz gives very explicit directions as to how to proceed in carrying out the test, and mentions a number of pitfalls to be avoided. His results have led him, as is the case with all other investigators, to regard the sero diagnostic test of pregnancy as an extremely delicate and reliable one.

The Treatment of Eclampsia by Intra-Spinal Injection of Magnesium Sulphate. (*Zur Eklampsiebehandlung durch Injektionen in den Rückenmarkskanal*). PROF. GUGGISBERG in Bern, *Zentralb. für Gynäkologie,* No. 11, March 15, 1913.

The brilliant results obtained by injecting magnesium sulphate solution intraspinally in cases of tetanus have led some observers, principally Rissmann, to use similar solutions in eclampsia. Guggisberg employed the magnesium sulphate solution in two cases with fatal outcome. He used from 5 to 10 cc.m. of the 15 per cent solution and could see an effect on the lower extremities alone. The upper extremities continued in convulsion. Guggisberg admits that these could be controlled by intraspinal injection higher up in the cord, but this would not be altogether a safe procedure as it might cause respiratory paralysis.

The Extended Abdominal Radical Operation for Cancer of the Uterus. WILLIAM WEIBEL, Vienna. *Surgery, Gynecology and Obstetrics,* March, 1913.

Two points characterize the radical operation for cancer of the uterus as practiced by Wertheim: (1) the widest excision of the parametria, and (2) removal of the pelvic glands. Another essential feature of the operation is the preliminary exposure of the ureters for the purpose of getting them out of the way. After wide excision of the parametrium the next step is the removal of the glands. These lie along the common iliac, the external, and the hypogastric iliacs, and in the trigonum between both, also downwards to the obturator foramen and high up as far as the division of the aorta. The search for enlarged glands never proceeds higher than this point. The pelvic wound is always drained by iodoform gauze and the peritoneum is closed carefully.

The after-results are improved by perfecting the technique and not by increasing the operability percentage. The immediate mortality is not necessarily increased by thorough performance of the operation. In the experience of Wertheim with a total of 675 cases operated upon out of a series of 1,430 cases of carcinoma of the cervix examined, there was 19.5 per cent of absolute cure; 43 per cent of all operated cases were cured permanently, i. e., 53 per cent of all cases surviving the operation.

Normal Serum of Pregnancy in the Treatment of Uncontrollable Vomiting of Pregnancy. (*Normales Schwangerenserum bei unstillbaren Erbrechen der Schwangeren*). W. RUBESKA. *Zentrallblatt für Gynäkologie,* No. 9. March 1, 1913.

The use of normal serum of the pregnant woman has been applied to a number of the toxicoses of pregnancy since Mayer's and R. Freund's recommendation. Its application to uncontrollable vomiting of pregnancy has not been undertaken by many obstetricians. Hence the report of the use of two cases of incessant vomiting of pregnancy thus treated. Both cases were in the early months of gestation. Most of the measures ordinarily tried were of no avail. In each case normal serum from an advanced case of pregnancy was injected intramuscularly and intravenously *without the slightest improvement.* Several injections were subcutaneous. After a fair trial of the serum without effect, pregnancy had to be terminated in each case, whereupon the vomiting ceased and the general condition of the patient improved.

The Treatment of Hernia in Children. A. J. OCHSNER, Chicago. *The Journal-Lancet,* March 1, 1913.

From a consideration of the literature and from his own cases, Ochsner concludes that there is a very marked tendency to spontaneous healing of hernia in childhood and that the radical treatment by operation is entirely unnecessary in by far the greatest number of cases. Approximately 95 per cent of all cases of hernia in children will heal spontaneously if the abnormal intraabdominal pressure be relieved and the hernial sac be kept empty. This can be accomplished by means of trusses, or much more rapidly in inguinal and femoral hernia, by placing the child in bed with the foot of the bed elevated. The time required usually does not exceed six weeks and in most cases the hernia will heal on relieving the intra-abdominal pressure and simply placing the child in bed with the foot of the bed elevated each night from 6 P. M. to 8 A. M. the following morning for several months. Coughs, gaseous abdominal distention, constipation and phimosis must be removed if present. Operation is indicated (a) in strangulated hernia; (b) in irreducible hernia due to adhesion; (c) in case the opening is unusually large in a free hernia, especially if the condition is hereditary; (d) in reducible hydrocele; (e) in cases with undescended testicle unless they show a tendency toward spontaneous cure. The recumbent position with the foot of the bed raised is of very great importance in the after-treatment of operated cases.

Vulvovaginitis in Children. EDITH ROGERS SPAULDING, Boston. *American Journal of Diseases of Children,* March, 1913.

The writer of this article records the conclusions arrived at in the study of vulvoganitis in children at the special clinic for this disease in the Children's Hospital in Boston. From a careful consideration of the literature and from a study of the eighty-six cases at the clinic the following conclusions are drawn:

1. That all cases of vaginitis with a persistent discharge, which at any time has been profuse, are due primarily to the gonococcus.

2. That the disease may extend over many years, during which time there may be many recurrences, and that the periods of latency may at least be as long as eighteen months.

3. That vulvovaginitis in children, although it may remain a local disease, is liable to any of the complications seen in adults.

4. That the most efficient treatment does not insure a permanent cure.

5. And finally, that physicians should realize the importance and prevalence of the disease and institute stricter preventive measures, both in hospitals and in private practice.

Immediate Treatment of Depressed Fractures of the Skull in the New Born. GEO. W. KOSMAK, Bulletin of the Lying-In Hospital of New York City, March, 1913.

Kosmak urges the examination of the infant's head in every instance, especially where labor has been prolonged, for the possibility of a depressed fracture. Whenever this is found an attempt should be made to elevate the depressed bones. For this purpose he has devised a simple contrivance, namely a modification of the single hook such as obtains in the ordinary double tenaculum forceps. The skin over the central part of the depression or over the cleft that may be felt, is shaved and painted with tincture of iodine. The hook is passed in until the inner table is encountered, when the fragment may be elevated by turning the handle at right angles to the surface and by steady outward traction. Kosmak has used this procedure with gratifying results on four cases.

A New Operative Method for Volkmann's Ischemic Contracture. (*Ueber eine Neue Methode fur Operativen Behandlung der Ischaemischen Kontraktur*) A. HORWITZ, Berlin. *Deutsche Zeitschrift puer Chirurgie,* March, 1913.

On the theory that the position of the hand in extreme flexion, so characteristic of Volkmann's contracture, would be overcome by an operation directed at the wrist-joint, the following operation was performed upon a typical instance of that malady. A dorso-radial incision was made over the wrist-joint. The tendon of the long extensor of the thumb was temporarily divided. All the bones comprising the first row of the carpus were then removed. Through a ventral incision all contracture was overcome by combined tenotomies and tenoplasties. The hand was fixed in an exaggerated dorsal position.

The end-result was excellent. Within six months the patient was enabled to write with the hand and to return to his work, that of typesetting. The result is illustrated by photographs and specimens of penmanship.

Skiagraphy of the Seminal Ducts. W. T. BELFIELD, Chicago. *Journal American Medical Association,* March 15, 1913.

Belfield describes his method of making skiagrams of the seminal ducts by the use of collargol injected through an incision (vasotomy) in the vas deferens just above the testicle. The strength of the collargol should not exceed from 10 to 15 per cent; the quantity injected at one sitting should in general be limited to 4 or 5 c.c., and should immediately cease if pain in groin or rectum occurs. If the vas is occluded by stricture, even 1 or 2 c.c. may cause severe pain. Regurgitation of collargol into the connective tissue around the incision follows overdistention and

causes a tender induration, which usually gradually subsides without suppuration. If there is no occlusion of the duct, collargol is passed with the urine for days following the injection and the emittent semen is black. When the weaker, non-irritating solutions are given at body temperature, the distended vas and vesicle may expel their contents into the urethra and bladder and even out at the meatus. "Among the features revealed by this method are (1) a peristalsis of ampulla and vesicle into the prostatic urethra, without the phenomena of emission—a function which explains certain obscure clinical phenomena; (2) the sphincteric closure of ampulla and vesicle; (3) the not infrequent occlusion of the ejaculatory duct, converting vas and vesicle into a retention cyst."

The Pathology and Treatment of Callous Ulcer of the Bladder. LEO BUERGER, New York. *New York Medical Journal,* April 12, 1913.

1. Clinical, cystoscopic and pathological studies in two cases of vesical ulceration have conclusively shown that simple callous ulcer of the bladder can and does exist.

2. The clinical symptoms of this condition are intense dysuria, urgency, frequency of micturition with sanguineous and purulent urine. The manifestations become progressively more marked and take a chronic course.

3. The chronicity of this disease and the progressive impairment of vesical capacity speak strongly for the view that chronic cystitis and contracted bladder are often the sequelæ and outcome of solitary ulceration.

4. The region of the trigone seems to be the favorite site for the chronic indurated type of ulceration.

5. Although designated as simple, and often as solitary ulcer of the bladder, this condition may be accompanied by one or more superficial erosions of the mucous membrane, elsewhere in the bladder interior, lesions which are undoubtedly secondary to the intense cystitis accompanying the ulcer.

6. The most effective and rapid method of curing the disease as well as the simplest procedure is the excision of the ulcerated area by means of operating cystoscope and punch forceps.

7. Less radical measures of treatment, such as cauterization with the actual cautery or fulguration, and silver nitrate irrigation are of no avail in this type of ulcer.

8. Histological examination in two cases has shown that the pathology of this condition is rather characteristic, there being a superficial deposit of urinary salts, a layer of necrosis and ulceration, and a stratum of newly formed connective tissue with active evidences of inflammation. The margin of the ulcer shows intensely vascular inflamed mucous membrane and submucosa.

9. In every case of chronic cystitis, particularly in women, where dysuria, urgency, and frequency of micturition are marked, a careful search should be made for this form of ulcer, for if it be present, it is more than likely that chronic cystitis, irritable and contracted bladder are secondary, and may be cured by the method advocated.

The Modern Treatment of Rupture of the Urethra. (*Le Traitement moderne des Ruptures de l'Urétre.*) G. MARION, Paris. *Journal d'Urologie Médicale et Chirurgicale,* April 15, 1913.

This lecture, delivered by Marion to a hospital audience in Paris, presents his viewpoint in a decisive manner. He believes that no treatment (operative) is necessary if a rupture of the urethra is not complicated by retention of urine, if there is no infiltration, if there is no annoying urethral discharge, or if the rupture is a purely intestinal one. Stricture need not result, in such instances, even if no treatment has been administered. Immediate intervention is indicated, however, in the presence of retention following rupture, in periurethral induration or disquieting discharge, whether or not these conditions are complicated by retention.

Any instrumental exploration of the urethra, in cases of rupture, is most strongly contraindicated. Such exploration, or attempts at catheterization, can only infect the seat of the rupture and can be of no value to the patient. Treatment consists in an end-to-end suture of the ruptured urethra and is completed by the establishment of suprapubic drainage in order to avoid infection of the urethra by the presence of a permanent catheter.

The Grafting of Preserved Amniotic Membrane to Burned and Ulcerated Surfaces Substituting Skin Grafts. M. STERN, New York. *Journal of the American Medical Association,* March 29, 1913.

The use of amniotic membrane tissue of the human species is logical in that it is homologous and essentially an embryonic offspring of the skin and composed of dermal elements. Its use in skin-grafting has the advantage over freshly cut skin-grafts in that it eliminates the use of the razor and the secondary wounds thus produced. The inner layer of true amniotic origin is the one employed, as it will adhere to the denuded surface, being itself embryonic skin. Stern follows the technic of Carrel for preserving and fixing the tissues. He keeps the tissue in petrolatum after it has been washed clear of blood in normal salt solution and dried between layers of sterile gauze. Liquid petrolatum will do when a specimen is to be used many times and used up within a few weeks. When the denuded surface to be grafted has been thoroughly cleansed from all secretion and bits of tissue, a section of the graft is spread smoothly, care being taken to press out all air bubbles and also that the amniotic or glistening side is applied to the wound. Then it is brushed over with wax dressing, a mixture of paraffin, beeswax and castor oil, care being taken not to displace the graft. He has employed this tissue and these methods on ulcers, burns, scalds and traumatic denudations with more marked success than other methods.

The Therapy of Plaut Vincent Angina. (*Zur therapie der Angina Plaut-Vincenti.*) J. CITRON, Berlin, *Berliner Klinische Wochenschrift,* April 7, 1913.

Citron reports two cases in which the local application of salvarsan brought about a prompt cure. He used a trituration of salvarsan in glycerin (0.1 to 5 ccm.), which was applied on three successive days. In five days, the lesions were entirely healed and have remained so.

Round Ulcer of the Duodenum in the First Year of Life. (*Das Ulcus rotundus duodeni im ersten Lebensjahr.*) W. SCHMIDT, *Berliner Klinische Wochenschrift,* March 31, 1913.

In 1109 autopsies on children, Schmidt found 1.8 per cent duodenal ulcers. Inasmuch as the percentage in adults is only 0.6 per cent, the accepted notion that duodenal ulcer is more common in adults than in children is wrong. The ulcers varied in size from a split-pea to a quarter. In some instances, as many as two, three and even five ulcers were found. The majority of the children were emaciated, and afflicted with severe septic processes, such as phlegmons and empyema. One patient was tuberculous. The diagnosis is difficult and in many cases impossible, inasmuch as no symptoms were present in 14 of the 20 cases. In the others, the only symptom was hemorrhage from the rectum, very often fatal.

The Treatment of Beginning Gangrene. (*Zur Behandlung beginnender Gangrän.*) M. BORCHARDT, Berlin, *Zentralblatt für Chirurgie,* March 1, 1913.

The patient had already lost one leg from arteriosclerotic gangrene, when symptoms of impending gangrene began in the other. Borchardt tried alternate plunging of the affected extremity into cold and hot baths; the leg was immersed in each bath for a few seconds and the procedure was repeated 40 or 50 times. The temperature of the hot water was slowly increased, beginning at 35°C. and ending at 55°C. This procedure was employed morning and night over a period of weeks. Up to date, one and a quarter years later, all signs of gangrene have disappeared.